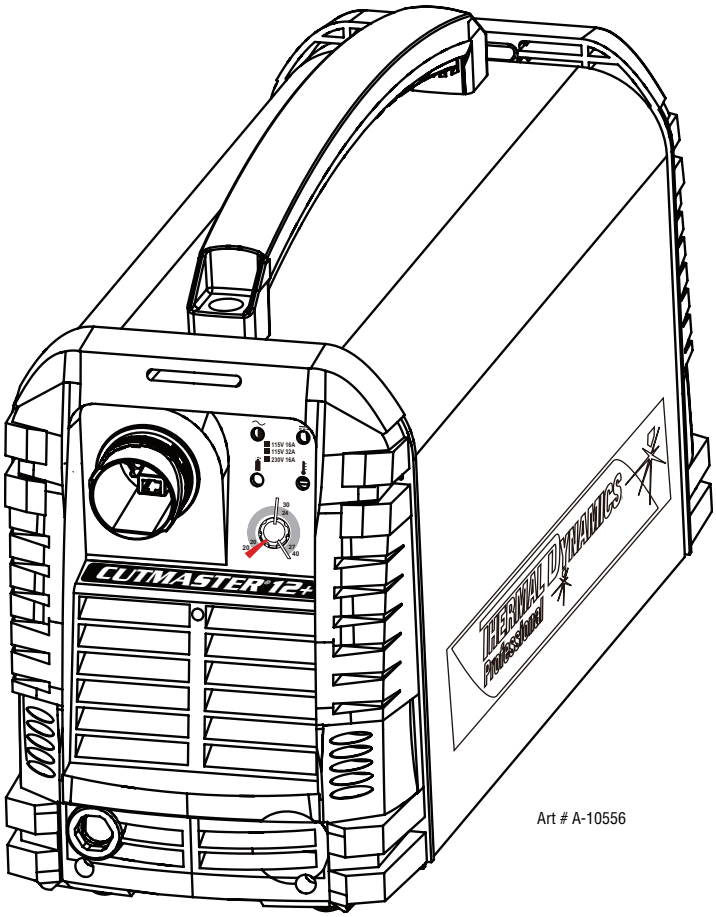
THERMAL DYNAMICS®

12+

CUTMASTER™

PLASMA CUTTING SYSTEM



Art # A-10556

Service Manual

Revision: AC **Issue Date:** September 3, 2012 **Manual No.:** 0-5198

Operating Features:

CE

40 AMP	DC	1 PHASE	115 VAC	230 VAC

WE APPRECIATE YOUR BUSINESS!

Congratulations on your new Thermal Dynamics product. We are proud to have you as our customer and will strive to provide you with the best service and reliability in the industry. This product is backed by our extensive warranty and world-wide service network. To locate your nearest distributor or service provider visit us on the web at **www.thermal-dynamics.com (Americas and Europe).**

This Service Manual has been designed to instruct you on the correct use and operation of your Thermal Dynamics product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product. We have made every effort to provide you with accurate instructions, drawings, and photographs of the product(s) we used when writing this manual. However errors do occur and we apologize if there are any contained in this manual.

Due to our constant effort to bring you the best products, we may make an improvement that does not get reflected in the manual. If you are ever in doubt about what you see or read in this manual with the product you received, then check for a newer version of the manual on our website or contact our customer support for assistance.

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The Brand of Choice for Contractors and Fabricators Worldwide.
Thermal Dynamics is a Global Brand of manual and automation Plasma Cutting Products for Victor Technologies Inc.

We distinguish ourselves from our competition through market-leading, dependable products that have stood the test of time. We pride ourselves on technical innovation, competitive prices, excellent delivery, superior customer service and technical support, together with excellence in sales and marketing expertise.

Above all, we are committed to developing technologically advanced products to achieve a safer working environment within the welding industry.

WARNINGS

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment.

While the information contained in this Manual represents the Manufacturer's best judgement, the Manufacturer assumes no liability for its use.

Plasma Cutting Power Supply
CutMaster™ 12+
SL40 Torch™
Service Manual I Number 0-5198

Published by:
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Revision AC Date: September 3, 2012

Record the following information for Warranty purposes:

Where Purchased:_____ _____

Purchase Date:_____

Power Supply Serial #:_____

Torch Serial #:_____ _____

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SECTION 1: GENERAL INFORMATION

1.01 Notes, Cautions and Warnings

Throughout this manual, notes, cautions, and warnings are used to highlight important information. These highlights are categorized as follows:

NOTE

An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION

A procedure which, if not properly followed, may cause damage to the equipment.

WARNING

A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

1.02 Important Safety Precautions

WARNING

OPERATION AND MAINTENANCE OF PLASMA ARC EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.

Plasma arc cutting produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near plasma arc cutting applications should consult their medical health professional and the manufacturer of the health equipment to determine whether a hazard exists.

To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call 1-603-298-5711 or your local distributor if you have any questions.

GASES AND FUMES

Gases and fumes produced during the plasma cutting process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the welding fume plume.
- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the plasma arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or welding any metals which may contain one or more of the following:

Antimony	Chromium	Mercury
Arsenic	Cobalt	Nickel
Barium	Copper	Selenium
Beryllium	Lead	Silver
Cadmium	Manganese	Vanadium

- Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using. These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
- For information on how to test for fumes and gases in your workplace, refer to item 1 in Subsection 1.03, Publications in this manual.
- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.
- This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Sec. 25249.5 et seq.)

ELECTRIC SHOCK

Electric Shock can injure or kill. The plasma arc process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically “live” or “hot.”
- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Install and maintain equipment according to NEC code, refer to item 9 in Subsection 1.03, Publications.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.

FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks, or the plasma arc.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapors from the workplace.
- Do not cut or weld on containers that may have held combustibles.

- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminum workpieces when they are cut underwater or while using a water table. DO NOT cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.

NOISE

Noise can cause permanent hearing loss. Plasma arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
- For information on how to test for noise, see item 1 in Subsection 1.03, Publications, in this manual.

PLASMA ARC RAYS

Plasma Arc Rays can injure your eyes and burn your skin. The plasma arc process produces very bright ultra violet and infrared light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a welding helmet or shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear welding gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep helmet and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens or shields.
- Use the shade of lens as suggested in the following chart.

NOTE

These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

AWS F2.2:2001 (R2010), Adapted with permission of the American Welding Society (AWS), Miami, Florida

Guide for Shade Numbers				
(From AWS F2.2, Lens Shade Selector) Shade numbers are given as a guide only and may be varied to suit individual needs.				
Process	Electrode Size in. (mm)	Arc Current (Amperes)	Minimum Protective Shade	Suggested* Shade No. (Comfort)
Shielded Metal Arc Welding (SMAW)	Less than 3/32 (2.4) 3/32-5/32 (2.4-4.0) 5/32-1/4 (4.0-6.4) More than 1/4 (6.4)	Less than 60 60-160 160-250 250-550	7 8 10 11	- 10 12 14
Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW)		Less than 60 60-160 160-250 250-550	7 10 10 10	- 11 12 14
Gas Tungsten arc Welding (GTAW)		Less than 50 50-150 150-500	8 8 10	10 12 14
Air Carbon Arc Cutting (CAC-A)	(Light) (Heavy)	Less than 500 500-1000	10 11	12 14
Plasma Arc Welding (PAW)		Less than 20 20-100 100-400 400-800	6 8 10 11	6 to 8 10 12 14
Plasma Arc Cutting (PAC)		Less than 20 20-40 40-60 60-80 80-300 300-400 400-800	4 5 6 8 8 9 10	4 5 6 8 9 12 14
* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding, cutting, or brazing where the torch and/or the flux produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line of the visible light spectrum.				

Table 1-1

1.03 Publications

Refer to the following standards or their latest revisions for more information:

1. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
3. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103
14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

1.04 Servicing Hazards

WARNING

The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard.

Only qualified persons should test, maintain, and repair this unit.

Only qualified persons should test, maintain, and repair this unit.

WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off cutting power source and disconnect and lockout input power using line disconnect switch, circuit breakers, or by removing plug from receptacle, or stop engine before servicing unless the procedure specifically requires an energized unit.
- Insulate yourself from ground by standing or working on dry insulating mats big enough to prevent contact with the ground.
- Do not leave live unit unattended.
- If this procedure requires and energized unit, have only personnel familiar with and following standard safety practices do the job.
- When testing a live unit, use the one-hand method. Do not put both hands inside unit. Keep one hand free.
- Disconnect input power conductors from de-energized supply line BEFORE moving a cutting power source.

  SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.
- Turn Off inverters, disconnect input power, and discharge input capacitors according to instructions in Troubleshooting Section before touching any parts.

WARNING

STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.

WARNING

FIRE OR EXPLOSION hazard.

- Do not place unit on, over, or near combustible surfaces.
- Do not service unit near flammables.

WARNING

FLYING METAL or DIRT can injure eyes.

- Wear safety glasses with side shields or face shield during servicing.
- Be careful not to short metal tools, parts, or wires together during testing and servicing.

WARNING

HOT PARTS can cause sever burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle not parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

WARNING

EXPLODING PARTS can cause injury.

- Failed parts can explode or cause other parts to explode when power is applied to inverters.
- Always wear a face shield and long sleeves when servicing inverters.

WARNING

SHOCK HAZARD from testing.

- Turn Off cutting power source or stop engine before making or changing meter lead connections.
- Use at least one meter lead that has a self-retaining spring clip such as an alligator clip.
- Read instructions for test equipment.

WARNING

FALLING UNIT can cause injury.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.

WARNING

MOVING PARTS can cause injury,

- Keep away from moving parts such as fans.
- Keep away from pinch points such as drive rolls.
- Have only qualified persons remove panels, covers, or guards for maintenance as necessary.
- Keep hands, hair, loose clothing, and tools away from moving parts.

- Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power.

WARNING

MAGNETIC FIELDS can affect Implanted Medical Devices.

- Wearers of Pacemakers and other Implanted Medical Devices should keep away from servicing areas until consulting their doctor and the device manufacturer.

WARNING

OVERUSE can cause OVERHEATING.

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to cut again.
- Do not block or filter airflow to unit.

WARNING

H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment install, test, and service H.F. producing units.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

WARNING

READ INSTRUCTIONS.

- Use Testing Booklet (Part No. 150 853) when servicing this unit.
- Consult the Owner's Manual for cutting safety precautions.
- Use only genuine replacement parts from the manufacturer.

1.05 EMF Information

Considerations About Cutting And The Effects Of Low Frequency Electric And Magnetic Fields

Cutting current, as it flows through cutting cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep cutting power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Implanted Medical Devices:

Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.

1.06 Note, Attention et Avertissement

Dans ce manuel, les mots “note,” “attention,” et “avertissement” sont utilisés pour mettre en relief des informations à caractère important. Ces mises en relief sont classifiées comme suit :

NOTE

Toute opération, procédure ou renseignement général sur lequel il importe d’insister davantage ou qui contribue à l’efficacité de fonctionnement du système.

ATTENTION

Toute procédure pouvant résulter l’endommagement du matériel en cas de non-respect de la procédure en question.

AVERTISSEMENT

Toute procédure pouvant provoquer des blessures de l’opérateur ou des autres personnes se trouvant dans la zone de travail en cas de non-respect de la procédure en question.

1.07 Precautions De Securite Importantes

AVERTISSEMENTS

L’OPÉRATION ET LA MAINTENANCE DU MATÉRIEL DE SOUDAGE À L’ARC AU JET DE PLASMA PEUVENT PRÉSENTER DES RISQUES ET DES DANGERS DE SANTÉ.

Coupant à l’arc au jet de plasma produit de l’énergie électrique haute tension et des émissions magnétique qui peuvent interférer la fonction propre d’un “pacemaker” cardiaque, les appareils auditif, ou autre matériel de santé electronique. Ceux qui travail près d’une application à l’arc au jet de plasma devrait consulter leur membre professionel de médication et le manufacturier de matériel de santé pour déterminer s’il existe des risques de santé.

Il faut communiquer aux opérateurs et au personnel TOUS les dangers possibles. Afin d’éviter les blessures possibles, lisez, comprenez et suivez tous les avertissements, toutes les précautions de sécurité et toutes les consignes avant d’utiliser le matériel. Composez le + 603-298-5711 ou votre distributeur local si vous avez des questions.

FUMÉE et GAZ

La fumée et les gaz produits par le procédé de jet de plasma peuvent présenter des risques et des dangers de santé.

- Eloignez toute fumée et gaz de votre zone de respiration. Gardez votre tête hors de la plume de fumée provenant du chalumeau.
- Utilisez un appareil respiratoire à alimentation en air si l’aération fournie ne permet pas d’éliminer la fumée et les gaz.
- Les sortes de gaz et de fumée provenant de l’arc de plasma dépendent du genre de métal utilisé, des revêtements se trouvant sur le métal et des différents procédés. Vous devez prendre soin lorsque vous coupez ou soudez tout métal pouvant contenir un ou plusieurs des éléments suivants:

antimoine	cadmium	mercure
argent	chrome	nickel
arsenic	cobalt	plomb
baryum	cuivre	sélénium
béryllium	manganèse	vanadium

- Lisez toujours les fiches de données sur la sécurité des matières (sigle américain “MSDS”); celles-ci devraient être fournies avec le matériel que vous utilisez. Les MSDS contiennent des renseignements quant à la quantité et la nature de la fumée et des gaz pouvant poser des dangers de santé.
- Pour des informations sur la manière de tester la fumée et les gaz de votre lieu de travail, consultez l’article 1 et les documents cités à la page 5.
- Utilisez un équipement spécial tel que des tables de coupe à débit d’eau ou à courant descendant pour capter la fumée et les gaz.
- N’utilisez pas le chalumeau au jet de plasma dans une zone où se trouvent des matières ou des gaz combustibles ou explosifs.
- Le phosgène, un gaz toxique, est généré par la fumée provenant des solvants et des produits de nettoyage chlorés. Eliminez toute source de telle fumée.
- Ce produit, dans le procéder de soudage et de coupe, produit de la fumée ou des gaz pouvant contenir des éléments reconnu dans L’état de la Californie, qui peuvent causer des défauts de naissance et le cancer. (La sécurité de santé en Californie et la code sécurité Sec. 25249.5 et seq.)

CHOC ELECTRIQUE

Les chocs électriques peuvent blesser ou même tuer. Le procédé au jet de plasma requiert et produit de l’énergie électrique haute tension. Cette énergie électrique peut produire des chocs graves, voire mortels, pour l’opérateur et les autres personnes sur le lieu de travail.

- Ne touchez jamais une pièce “sous tension” ou “vive”; portez des gants et des vêtements secs. Isolez-vous de la pièce de travail ou des autres parties du circuit de soudage.
- Réparez ou remplacez toute pièce usée ou endommagée.
- Prenez des soins particuliers lorsque la zone de travail est humide ou moite.
- Montez et maintenez le matériel conformément au Code électrique national des Etats-Unis. (Voir la page *5,* article 9.)
- Débranchez l’alimentation électrique avant tout travail d’entretien ou de réparation.
- Lisez et respectez toutes les consignes du Manuel de consignes.

INCENDIE ET EXPLOSION

Les incendies et les explosions peuvent résulter des scories chaudes, des étincelles ou de l'arc de plasma. Le procédé à l'arc de plasma produit du métal, des étincelles, des scories chaudes pouvant mettre le feu aux matières combustibles ou provoquer l'explosion de fumées inflammables.

- Soyez certain qu'aucune matière combustible ou inflammable ne se trouve sur le lieu de travail. Protégez toute telle matière qu'il est impossible de retirer de la zone de travail.
- Procurez une bonne aération de toutes les fumées inflammables ou explosives.
- Ne coupez pas et ne soudez pas les conteneurs ayant pu renfermer des matières combustibles.
- Prévoyez une veille d'incendie lors de tout travail dans une zone présentant des dangers d'incendie.
- Le gas hydrogène peut se former ou s'accumuler sous les pièces de travail en aluminium lorsqu'elles sont coupées sous l'eau ou sur une table d'eau. NE PAS couper les alliages en aluminium sous l'eau ou sur une table d'eau à moins que le gas hydrogène peut s'échapper ou se dissiper. Le gas hydrogène accumulé explosera si enflammé.

BRUIT

Le bruit peut provoquer une perte permanente de l'ouïe. Les procédés de soudage à l'arc de plasma peuvent provoquer des niveaux sonores supérieurs aux limites normalement acceptables. Vous dú4ez vous protéger les oreilles contre les bruits forts afin d'éviter une perte permanente de l'ouïe.

- Pour protéger votre ouïe contre les bruits forts, portez des tampons protecteurs et/ou des protections auriculaires. Protégez également les autres personnes se trouvant sur le lieu de travail.
- Il faut mesurer les niveaux sonores afin d'assurer que les décibels (le bruit) ne dépassent pas les niveaux sûrs.
- Pour des renseignements sur la manière de tester le bruit, consultez l'article 1.

RAYONS D'ARC DE PLASMA

Les rayons provenant de l'arc de plasma peuvent blesser vos yeux et brûler votre peau. Le procédé à l'arc de plasma produit une lumière infra-rouge et des rayons ultra-violets très forts. Ces rayons d'arc nuiront à vos yeux et brûleront votre peau si vous ne vous protégez pas correctement.

- Pour protéger vos yeux, portez toujours un casque ou un écran de soudeur. Portez toujours des lunettes de sécurité munies de parois latérales ou des lunettes de protection ou une autre sorte de protection oculaire.
- Portez des gants de soudeur et un vêtement protecteur approprié pour protéger votre peau contre les étincelles et les rayons de l'arc.
- Maintenez votre casque et vos lunettes de protection en bon état. Remplacez toute lentille sale ou comportant fissure ou rognure.
- Protégez les autres personnes se trouvant sur la zone de travail contre les rayons de l'arc en fournissant des cabines ou des écrans de protection.
- Utilisez la nuance de lentille qui est suggèrée dans le recommendation qui suivent tableau.

NOTE

Ces valeurs s'appliquent ou l'arc actuel est observé clairement. L'experience a démontrer que les filtres moins foncés peuvent être utilisés quand l'arc est caché par moiceau de travail.

1.08 Documents De Reference

Consultez les normes suivantes ou les révisions les plus récentes ayant été faites à celles-ci pour de plus amples renseignements :

1. OSHA, NORMES DE SÉCURITÉ DU TRAVAIL ET DE PROTECTION DE LA SANTÉ, 29CFR 1910, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. Norme ANSI Z49.1, LA SÉCURITÉ DES OPÉRATIONS DE COUPE ET DE SOUDAGE, disponible auprès de la Société Américaine de Soudage (American Welding Society), 550 N.W. LeJeune Rd., Miami, FL 33126
3. NIOSH, LA SÉCURITÉ ET LA SANTÉ LORS DES OPÉRATIONS DE COUPE ET DE SOUDAGE À L'ARC ET AU GAZ, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. Norme ANSI Z87.1, PRATIQUES SURES POUR LA PROTECTION DES YEUX ET DU VISAGE AU TRAVAIL ET DANS LES ECOLES, disponible de l'Institut Américain des Normes Nationales (American National Standards Institute), 1430 Broadway, New York, NY 10018
5. Norme ANSI Z41.1, NORMES POUR LES CHAUSSURES PROTECTRICES, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
6. Norme ANSI Z49.2, PRÉVENTION DES INCENDIES LORS DE L'EMPLOI DE PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
7. Norme A6.0 de l'Association Américaine du Soudage (AWS), LE SOUDAGE ET LA COUPE DE CONTENEURS AYANT RENFERMÉ DES PRODUITS COMBUSTIBLES, disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126
8. Norme 51 de l'Association Américaine pour la Protection contre les Incendies (NFPA), LES SYSTEMES À GAZ AVEC ALIMENTATION EN OXYGENE POUR LE SOUDAGE, LA COUPE ET LES PROCÉDÉS ASSOCIÉS, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
9. Norme 70 de la NFPA, CODE ELECTRIQUE NATIONAL, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
10. Norme 51B de la NFPA, LES PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
11. Brochure GCA P-1, LA MANIPULATION SANS RISQUE DES GAZ COMPRIMÉS EN CYLINDRES, disponible auprès de l'Association des Gaz Comprimés (Compressed Gas Association), 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202
12. Norme CSA W117.2, CODE DE SÉCURITÉ POUR LE SOUDAGE ET LA COUPE, disponible auprès de l'Association des Normes Canadiennes, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada, M9W 1R3
13. Livret NWSA, BIBLIOGRAPHIE SUR LA SÉCURITÉ DU SOUDAGE, disponible auprès de l'Association Nationale de Fournitures de Soudage (National Welding Supply Association), 1900 Arch Street, Philadelphia, PA 19103
14. Norme AWSF4.1 de l'Association Américaine de Soudage, RECOMMANDATIONS DE PRATIQUES SURES POUR LA PRÉPARATION À LA COUPE ET AU SOUDAGE DE CONTENEURS ET TUYAUX AYANT RENFERMÉ DES PRODUITS DANGEREUX , disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126
15. Norme ANSI Z88.2, PRATIQUES DE PROTECTION RESPIRATOIRE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018

1.09 Declaration of Conformity

Manufacturer: Victor Technologies

Address: 82 Benning Street

West Lebanon, New Hampshire 03784

USA

The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 2006/95/EC) and to the National legislation for the enforcement of this Directive.

The equipment described in this manual conforms to all applicable aspects and regulations of the "EMC Directive" (European Council Directive 2004/108/EC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

* CSA (Canadian Standards Association) standard C22.2 number 60 for Arc welding equipment.
* UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.
* CENELEC EN50199 EMC Product Standard for Arc Welding Equipment.
* ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) (EN50192) (EN50078) applicable to plasma cutting equipment and associated accessories.
* 2002/95/EC RoHS directive.
* AS60974.1 Arc Welding Equipment Welding Power Sources.

For environments with increased hazard of electrical shock, Power Supplies bearing the S mark conform to EN50192 when used in conjunction with hand torches with exposed cutting tips, if equipped with properly installed standoff guides.

* Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

WARNING

This equipment does not comply with IEC 61000-3-12. If it is connected to a public low voltage system, it is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment may be connected.

Victor Technologies has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative in Europe: Steve Ward

Operations Director

Victor Technologies Europe

Europa Building

Chorley N Industrial Park

Chorley, Lancashire,

England PR6 7BX

1.10 Statement of Warranty

LIMITED WARRANTY: Subject to the terms and conditions established below, Victor Technologies warrants to the original retail purchaser that new Thermal Dynamics CUTMASTER® plasma cutting systems sold after the effective date of this warranty are free of defects in material and workmanship. Should any failure to conform to this warranty appear within the applicable period stated below, Victor Technologies shall, upon notification thereof and substantiation that the product has been stored operated and maintained in accordance with Victor Technologies's specifications, instructions, recommendations and recognized industry practice, correct such defects by suitable repair or replacement.

This warranty is exclusive and in lieu of any warranty of merchantability or fitness for a particular purpose.

Victor Technologies will repair or replace, at its discretion, any warranted parts or components that fail due to defects in material or workmanship within the time periods set out below. Victor Technologies must be notified within 30 days of any failure, at which time Victor Technologies will provide instructions on the warranty procedures to be implemented.

Victor Technologies will honor warranty claims submitted within the warranty periods listed below. All warranty periods begin on the date of sale of the product to the original retail customer or 1 year after sale to an authorized Distributor.

LIMITED WARRANTY PERIOD

Product	Power Supply Components (Parts and Labor)	Torch and Leads (Parts and Labor)
CUTMASTER 12+	3 Years	1 Year

This warranty does not apply to:

1. Consumable Parts, such as tips, electrodes, shield cups, o - rings, starter cartridges, gas distributors, fuses, filters.
2. Equipment that has been modified by an unauthorized party, improperly installed, improperly operated or misused based upon industry standards.

In the event of a claim under this warranty, the remedies shall be, at the discretion of Victor Technologies:

1. Repair of the defective product.
2. Replacement of the defective product.
3. Reimbursement of reasonable costs of repair when authorized in advance by Victor Technologies.
4. Payment of credit up to the purchase price less reasonable depreciation based on actual use.

These remedies may be authorized by Victor Technologies and are FOB West Lebanon, NH or an authorized Victor Technologies service station. Product returned for service is at the owner's expense and no reimbursement of travel or transportation is authorized.

LIMITATION OF LIABILITY: Victor Technologies shall not under any circumstances be liable for special or consequential damages such as, but not limited to, damage or loss of purchased or replacement goods or claims of customer of distributors (hereinafter "Purchaser") for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Victor Technologies with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of the goods covered by or furnished by Victor Technologies whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which liability is based.

This warranty becomes invalid if replacement parts or accessories are used which may impair the safety or performance of any Victor Technologies product.

This warranty is invalid if the Thermal Dynamics product is sold by non - authorized persons.

Effective March 14,2011

SECTION 2 SYSTEM: INTRODUCTION

2.01 How to Use This Manual

To ensure safe operation, read the entire manual, including the chapter on safety instructions and warnings. Throughout this manual, the word WARNING, CAUTION and NOTE may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

WARNING

Gives information regarding possible personal injury. Warnings will be enclosed in a box such as this.

CAUTION

Refers to possible equipment damage. Cautions will be shown in bold type.

NOTE

Offers helpful information concerning certain operating procedures. Notes will be shown in italics

You will also notice icons from the safety section appearing throughout the manual. These are to advise you of specific types of hazards or cautions related to the portion of information that follows. Some may have multiple hazards that apply and would look something like this:

2.02 Equipment Identification

The unit's identification number (specification or part number), model, and serial number usually appear on a nameplate attached to the machine. Equipment which does not have a nameplate attached to the machine is identified only by the specification or part number printed on the shipping container. Record these numbers for future reference.

2.03 Receipt of Equipment

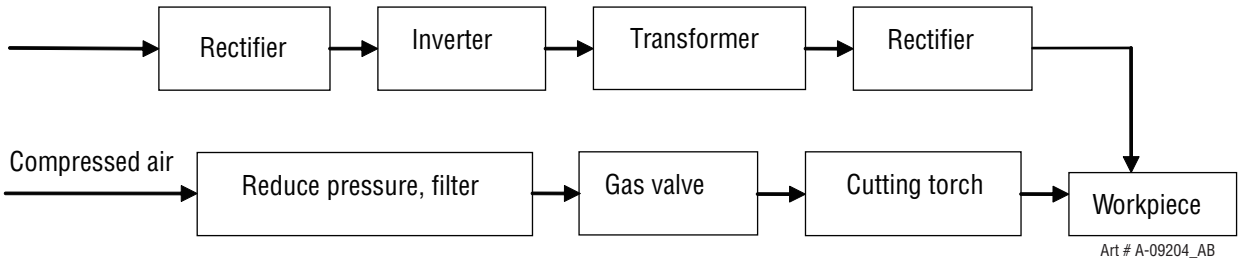
When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to the location in your area listed in the inside back cover of this manual. Include all equipment identification numbers as described above along with a full description of the parts in error.

2.04 Transportation Methods

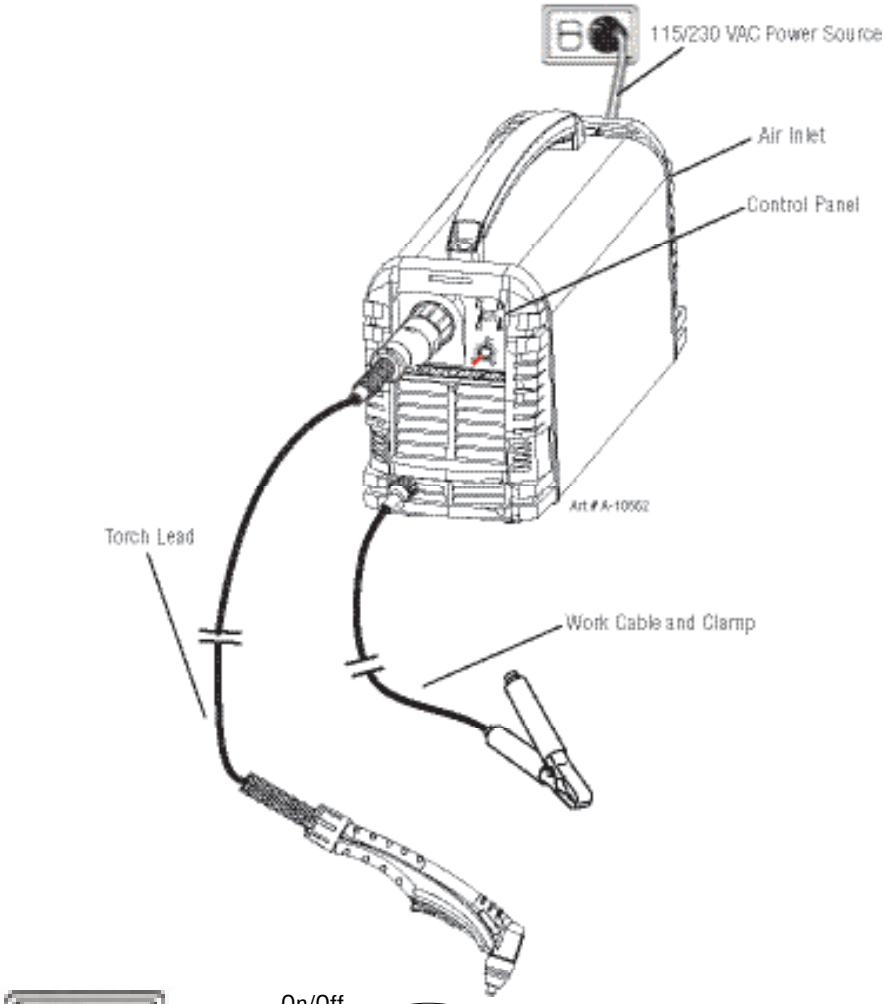
Disconnect input power conductors from de-energized supply line before moving the cutting power source.

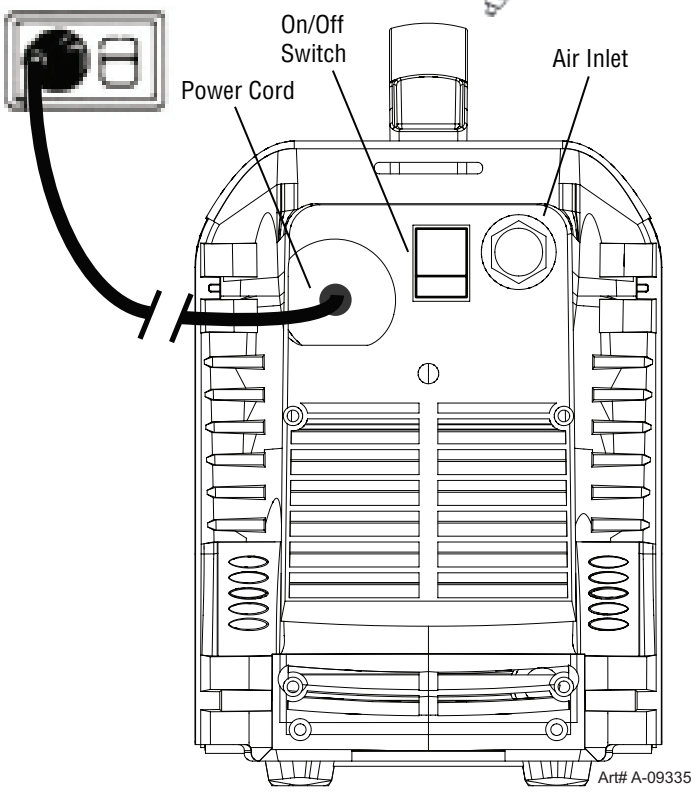
Lift unit with handle on top of case. Use handcart or similar device of adequate capacity. If using a fork lift vehicle, secure the unit on a proper skid before transporting.

2.05 Working Principle



2.06 Power Supply Features





SECTION 2TORCH: INTRODUCTION

2T.01 Scope of Manual

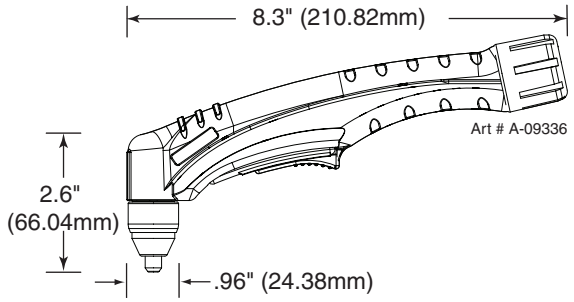
This manual contains descriptions, operating instructions and maintenance procedures for the SL40 Plasma Cutting Torch. Service of this equipment is restricted to properly trained personnel; unqualified personnel are strictly cautioned against attempting repairs or adjustments not covered in this manual, at the risk of voiding the Warranty. Read this manual thoroughly. A complete understanding of the characteristics and capabilities of this equipment will assure the dependable operation for which it was designed.

2T.02 Specifications

A. Torch Configurations

1. Hand Torch, Model SL40

The hand torch head is at 75° to the torch handle. The hand torches include a torch handle and torch trigger assembly.



B. Torch Leads Lengths

Hand Torches are available as follows:

- 15 ft / 4.6 m.

C. Torch Parts

Starter Cartridge, Electrode, Tip, Shield Cup

D. Parts - In - Place (PIP)

Torch has built-in switch.

12 vdc circuit rating

E. Type Cooling

Combination of ambient air and gas stream through torch.

F. Torch Ratings

SL40 Torch Ratings	
Ambient Temperature	104° F 40° C
Duty Cycle	100% @ 40 Amps @ 250 scfh
Maximum Current	40 Amps
Voltage (V_{peak})	500V
Arc Striking Voltage	500V

G. Current Ratings

SL40 Current Ratings	
SL40 Torch & Leads	Up to 40 Amps, DC, Straight Polarity

NOTE

Power Supply characteristics will determine material thickness range.

H. Gas Requirements

SL40 Torch Gas Specifications	
Gas (Plasma and Secondary)	Compressed Air
Minimum Input Pressure	85 psi 5.9 bar
Maximum Input Pressure	125 psi / 8.6 bar
Gas Flow	193 scfh 91 lpm

WARNING

This torch is not to be used with oxygen (O_2). This torch is not to be use with high frequency starting systems.

2T.03 Introduction to Plasma

A. Plasma Gas Flow

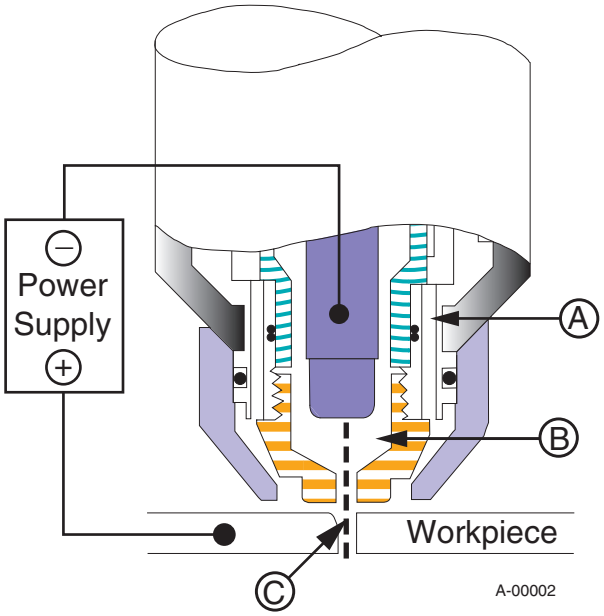
Plasma is a gas which has been heated to an extremely high temperature and ionized so that it becomes electrically conductive. The plasma arc cutting and gouging processes use this plasma to transfer an electrical arc to the workpiece. The metal to be cut or removed is melted by the heat of the arc and then blown away.

While the goal of plasma arc cutting is separation of the material, plasma arc gouging is used to remove metals to a controlled depth and width.

In a Plasma Cutting Torch a cool gas enters Zone B, where a arc between the electrode and the torch tip heats and ionizes the gas. The main cutting arc then transfers to the workpiece through the column of plasma gas in Zone C.

By forcing the plasma gas and electric arc through a small orifice, the torch delivers a high concentration of heat to a small area. The stiff, constricted plasma arc is shown in Zone C. Direct current (DC) straight polarity is used for plasma cutting, as shown in the illustration.

Zone A channels a secondary gas that cools the torch. This gas also assists the high velocity plasma gas in blowing the molten metal out of the cut allowing for a fast, slag - free cut.



Typical Torch Head Detail

B. Gas Distribution

The single gas used is internally split into plasma and secondary gases.

The plasma gas flows into the torch through the negative lead, through the starter cartridge, around the electrode, and out through the tip orifice.

The secondary gas flows down around the outside of the torch starter cartridge, and out between the tip and shield cup around the plasma arc.

C. Pilot Arc

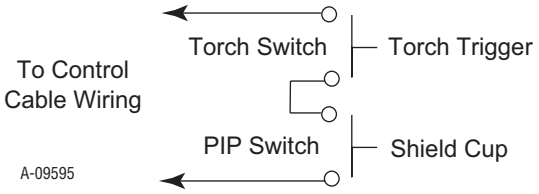
When the torch is started a pilot arc is established between the electrode and cutting tip. This pilot arc creates a path for the main arc to transfer to the work.

D. Main Cutting Arc

DC power is also used for the main cutting arc. The negative output is connected to the torch electrode through the torch lead. The positive output is connected to the workpiece via the work cable and to the torch through a pilot wire.

E. Parts - In - Place (PIP)

The torch includes a 'Parts - In - Place' (PIP) circuit. When the shield cup is properly installed, it closes a switch. The torch will not operate if this switch is open.



Parts - In - Place Circuit Diagram for Hand Torch

SECTION 3: INSTALLATION

3.01 Unpacking

1. Use the packing lists to identify and account for each item.

   A. Contents List

Description	Quantity
CM12+ Power source	1
10ft power input cable (installed)	1
Work cable and clamp (installed)	1
SL40 Torch (15ft(4.6m)) w/consumables	1
Carry case	1
40A Tip Drag	2
20A Tip Drag	2
40A Tip, Standoff	2
Electrode	2
Gloves	1
Cutting Glasses	1

2. Inspect each item for possible shipping damage. If damage is evident, contact your distributor and / or shipping company before proceeding with the installation.
3. Record Power Supply and Torch model and serial numbers, purchase date and vendor name, in the information block at the front of this manual.

3.02 Lifting Options

The Power Supply includes a handle for **hand lifting only.** Be sure unit is lifted and transported safely and securely.

WARNING

Do not touch live electrical parts.

Disconnect input power cord before moving unit.

WARNING

FALLING EQUIPMENT can cause serious personal injury and can damage equipment.

HANDLE is not for mechanical lifting.

- *Only persons of adequate physical strength should lift the unit.*
- *Lift unit by the handle, using two hands. Do not use straps for lifting.*
- *Use optional cart or similar device of adequate capacity to move unit.*
- *Place unit on a proper skid and secure in place before transporting with a fork lift or other vehicle.*

3.03 Primary Input Power Connections

Power Cord and Plug

This power supply comes installed with a input power cable with no plug, single-phase input power.

CAUTION

Check your power source for correct voltage before plugging in or connecting the unit. The primary power source, fuse, and any extension cords used must conform to local electrical code and the recommended circuit protection and wiring requirements as specified in Section 2.

Input Voltage (VAC)	Rated Output	Amps (RMS) input at rated output, 60 Hz, single-phase	KVA
115V, 16A Circuit	20A, 88V	21.3	2.5
115V, 32A Circuit	27A, 91V	21.3	3.5
230V, 16A Circuit	40A, 96V	23-21.4	4.8

3.04 Air Supply Connections

A. Connecting Air Supply to Unit

The connection is the same for compressed air or industrial compressed air in gas cylinders.

1. Connect the gas line to the compressed air inlet port at the appropriate pressure.

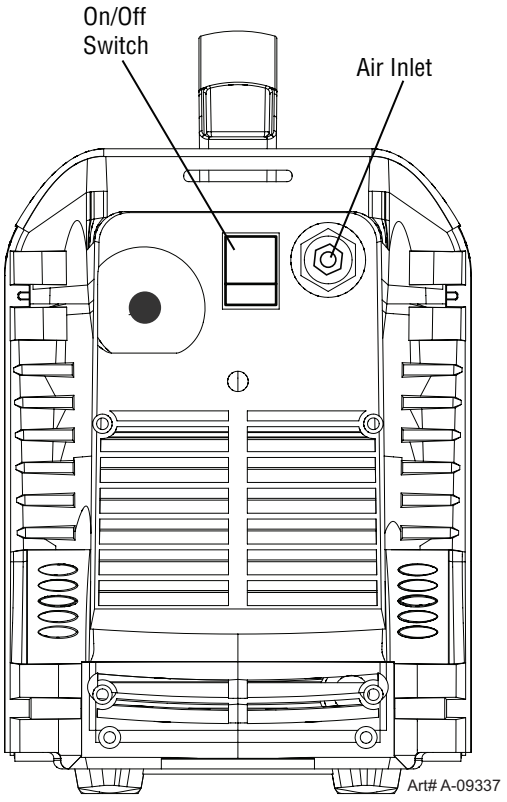


Figure 3-2 Gas Connection to Compressed Air input

B. Using Industrial Compressed Air In Gas Cylinders

When using Industrial compressed air in gas cylinders as the gas supply:

1. Refer to the manufacturer's specifications for installation and maintenance procedures for high pressure gas regulators.
2. Examine the cylinder valves to be sure they are clean and free of oil, grease or any foreign material. Briefly open each cylinder valve to blow out any dust which may be present.
3. The cylinder must be equipped with an adjustable high - pressure regulator capable of outlet pressures up to 100 psi (6.9 bar) maximum and flows of at least 250 scfh (120 lpm).
4. Connect gas supply hose to the cylinder.

NOTE

Pressure should be set at 100 psi (6.9 bar) at the high pressure gas cylinder regulator.

Supply hose must be at least 1/4 inch (6 mm) I.D.

For a secure seal, apply thread sealant to the fitting threads, according to manufacturer's instructions. Do Not use Teflon tape as a thread sealer, as small particles of the tape may break off and block the small gas passages in the torch.

3.05 Power Supply Specifications

CUTMASTER 12+ Power Supply Specifications	
Input Power	115 VAC (+-10%), 1Phase, 50/60Hz 230 VAC (+-10%), 1Phase, 50/60Hz
Output Current	20-27 Amps @ 115VAC 20-40 Amps @ 230VAC
CUTMASTER 12+ Power Supply Duty Cycle (Note 1)	
Ambient Temperature	104° F (40° C)
Duty Cycle	30% @ 115VAC, 40% @ 230VAC
Rated Current	27 Amps @ 115VAC, 40 Amps @ 230V
SL40 Torch Gas Requirements (see section 2T.03)	
Notes	
1. Duty Cycle is the percentage of time the system can be operated without overheating. Duty cycle is reduced if primary input voltage (AC) is low or the DC voltage is higher than shown in this chart.	
2. Air supply must be free of oil, moisture, and other contaminants. Excessive oil and moisture may cause double-arcing, rapid tip wear, or even complete torch failure. Contaminants may cause poor cutting performance and rapid electrode wear. Optional filters provide increased filtering capabilities.	

NOTE

IEC Rating is determined as specified by the International Electro-Technical Commission. These specifications include calculating an output voltage based upon power supply rated current. To facilitate comparison between power supplies, all manufacturers use this output voltage to determine duty cycle.

TDC Rating is determined using an output voltage representative of actual output voltage during cutting with a TDC torch. This voltage may be more or less than IEC voltage, depending upon choice of torch, consumables, and actual cutting operation.

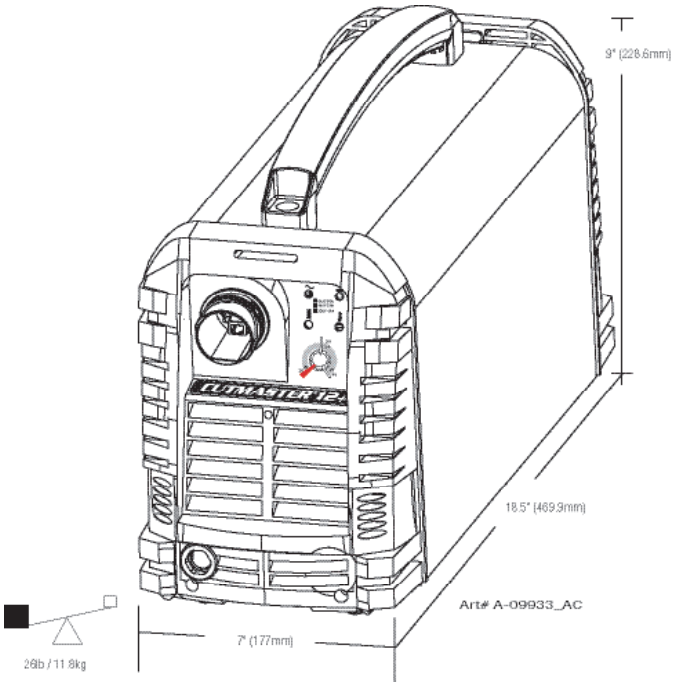


Figure 2-1 Power Supply Dimensions & Weight

NOTE

Weight includes torch & leads, input power cord, and work cable with clamp.

CAUTION

Provide clearance for proper air flow through the power supply. Operation without proper air flow will inhibit proper cooling and reduce duty cycle.

3.06 Input Wiring Specifications

CUTMASTER 12+ Input Power Requirements					
Input		Power Input	Current Input	Current Input	Suggested Sizes (See Note)
Voltage	Freq.	(kVA)	Max (Amps)	Ieff (Amps)	Fuse (Amps)
(Volts-AC)	(Hz)	1-Ph	1-Ph	1-Ph	1-Ph
115	50/60	3.3	28.5	15	32
230	50/60	5.0	21.4	13.5	16
240	50/60	5.0	20.8	13	16
Line Voltages with Suggested Circuit Protection					
Motor start fuses or thermal circuit breakers are recommended for this application. Check local requirements for your situation in this regard.					

NOTE

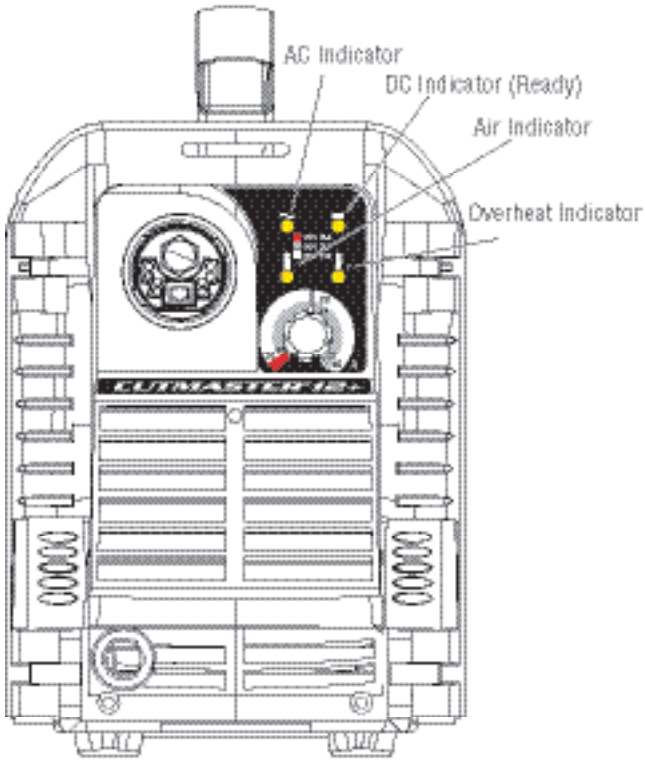
Refer to Local and National Codes or local authority having jurisdiction for proper wiring requirements. Cable size is de-rated based on the Duty Cycle of the equipment.

The suggested sizes are based on flexible power cable with power plug installations.

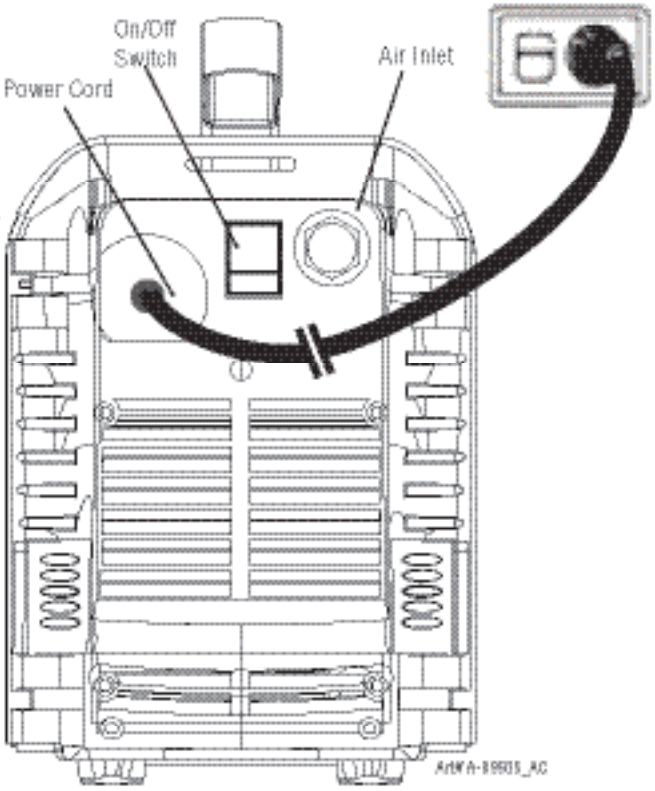
Cable conductor temperature used is 167° F (75° C).

SECTION 4 SYSTEM: OPERATION

4.01 Control Panel



The Front Panel



The Rear Panel

1. ON / OFF Switch (Power Switch/Lamp)

Controls input power to the power supply. I is ON (Red Lamp), O is OFF.

2. (A) Output Current Control

Sets the desired output current. If the overload protection (fuse or circuit breaker) on the input power circuit opens frequently, either reduce cutting output, reduce the cutting time, or connect the unit to more adequate input power. Note: For 120V input power, the unit will automatically limit the output current to a maximum of 27A. For 230V input power, the maximum output is 40 Amps. Refer to Section 2 for input power requirements.

3. ~ AC Indicator

Steady light indicates power supply is ready for operation.

4. OVERHEAT Indicator (TEMP Indicator)

Indicator is normally OFF. Indicator is ON when internal temperature exceeds normal limits. Allow the unit to run with the fan on until the temp indicator turns off.

5. AIR Indicator

AIR light should be ON when there is sufficient gas pressure.

6. ⎓ READY (DC Indicator)

Indicator is ON when DC output circuit is active.

NOTE

All consumables must be correctly installed and maintained to ensure correct operation.

4.02 Preparations For Operating

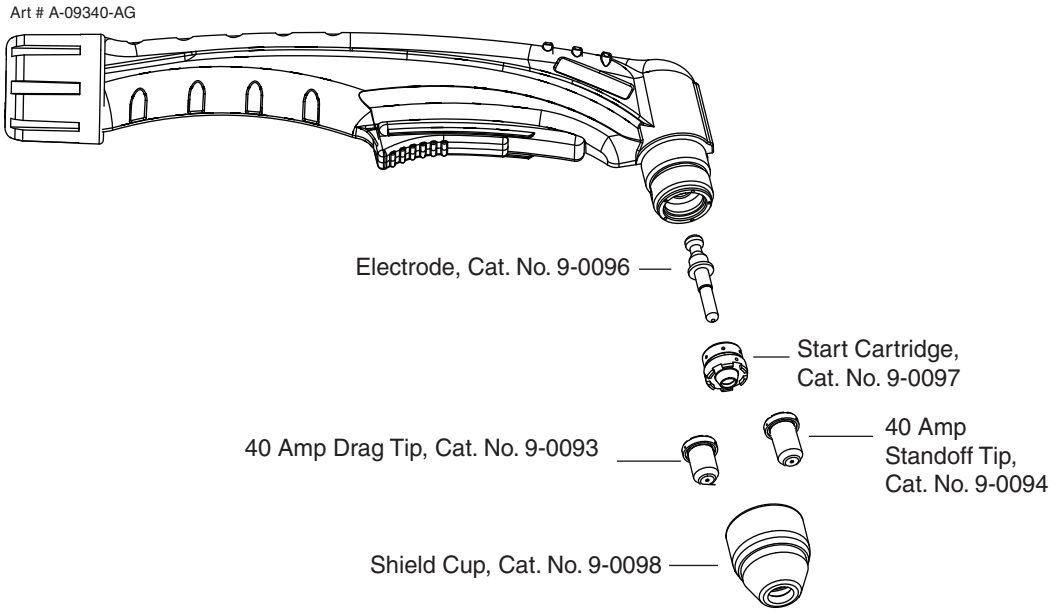
At the start of each operating session:

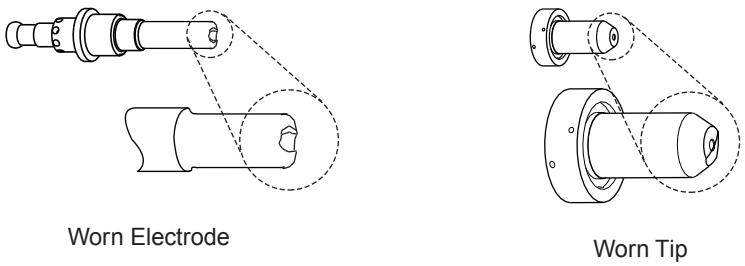
WARNING

Disconnect primary power at the source before assembling or disassembling power supply, torch parts, or torch and leads assemblies.

A. Torch Parts Selection

Check the torch for proper assembly and appropriate torch parts. The torch parts must correspond with the type of operation, and with the amperage output of this power supply (40 amps maximum). Use only genuine Thermal Dynamics parts with this torch.


Art # A-09340-AG
Electrode, Cat. No. 9-0096
Start Cartridge, Cat. No. 9-0097
40 Amp Drag Tip, Cat. No. 9-0093
40 Amp Standoff Tip, Cat. No. 9-0094
Shield Cup, Cat. No. 9-0098



NOTE

When operating the torch in a normal condition, some gas vents through the gap between the shield cup and torch handle. Do not attempt to over tighten the shield cup as irreparable damage to internal components may result.

B. Torch Connection

Check that the torch is properly connected.

C. Check Primary Input Power Source

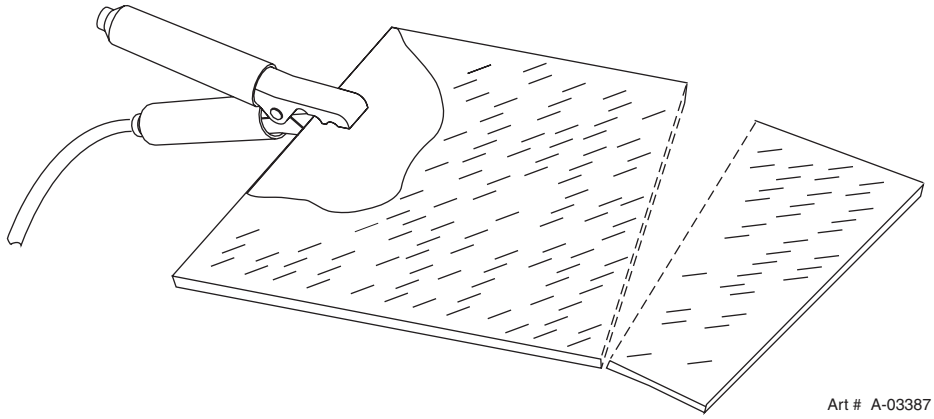
1. Check the power source for proper input voltage. Make sure the input power source meets the power requirements for the unit per Section 2, Specifications.
2. Connect the input power cable (or close the main disconnect switch) to supply power to the system.

D. Gas Selection

Ensure gas source meets requirements listed in section 2T. Check connections and turn gas supply on.

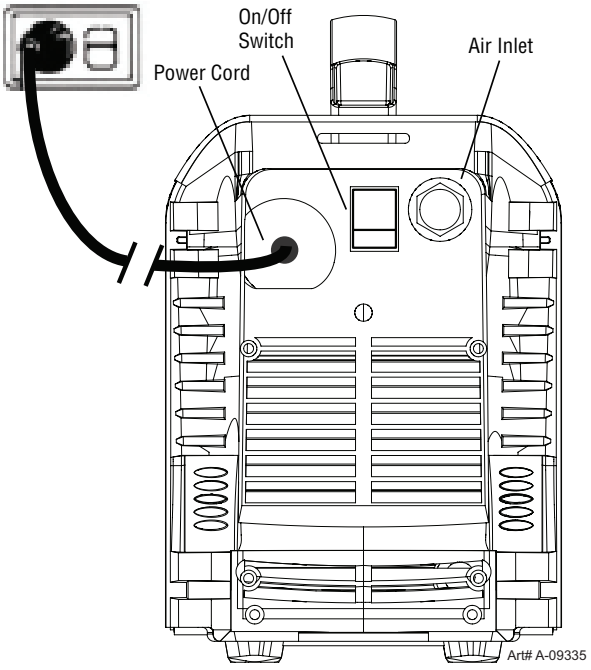
E. Connect Work Cable

Clamp the work cable to the workpiece or cutting table. The area must be free from oil, paint and rust. Connect only to the main part of the workpiece; do not connect to the part to be cut off.

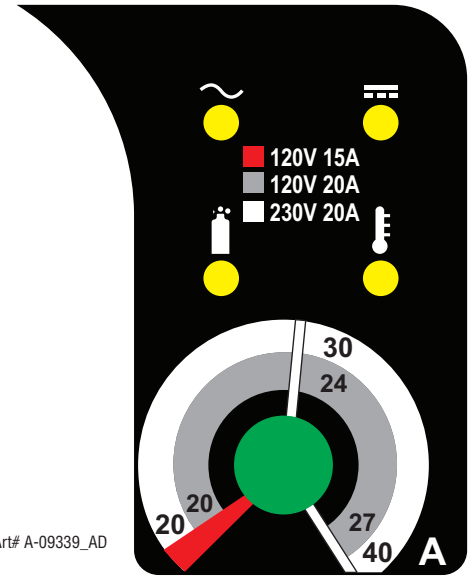


F. Power On

Place the power supply ON / OFF switch to the ON (I) position. Power indicator ~ turns on.



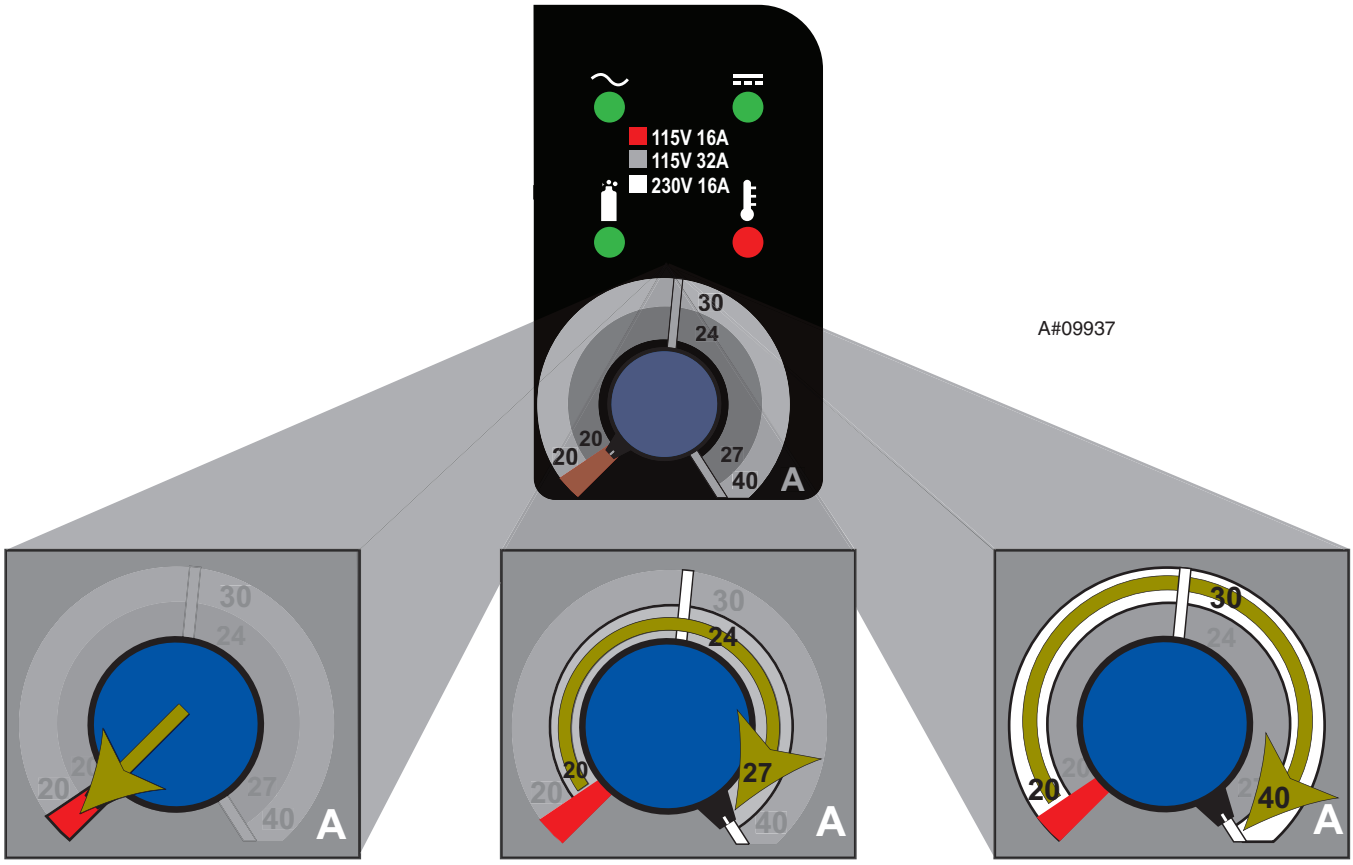
Rear Panel with ON/OFF Switch



Front Panel With Power ON/OFF Indicator

G. Select Current Output Level

Set the desired current output level.



4.03 Sequence of Operation

The following is a typical sequence of operation for this power supply.

1. Place the ON / OFF switch on the power supply to ON (up) position (Red indicator lamp is illuminated).
   a. AC indicator ~ turns on; fan turns on.

NOTE

During initial power up, there will be a delay of about 2 seconds before the AC Indicator light will illuminate and the pre-flow gas and fan starts. The gas will automatically flow from torch for approximately 10 seconds (only after the AC Indicator lamp is illuminated) (The AC Indicator lamp and fan turns on approximately 2 seconds after the ON/OFF switch is enabled), this is a process that makes sure all inputs (gas, input power, torch connection, and torch parts) are acknowledged for proper operation.

2. Wear protective clothing, including welding gloves and appropriate eye protection (see table 1-1). Place tip on work piece and pull trigger. Arc will initiate and start cutting material.

- **Standoff Cutting With Hand Torch**

NOTE

For best performance and parts life, always use the correct parts for the type of operation.

A. The torch can be comfortably held in one hand or steadied with two hands. Position the hand to press the Trigger on the torch handle. With the hand torch, the hand may be positioned close to the torch head for maximum control or near the back end for maximum heat protection. Choose the holding technique that feels most comfortable and allows good control and movement.

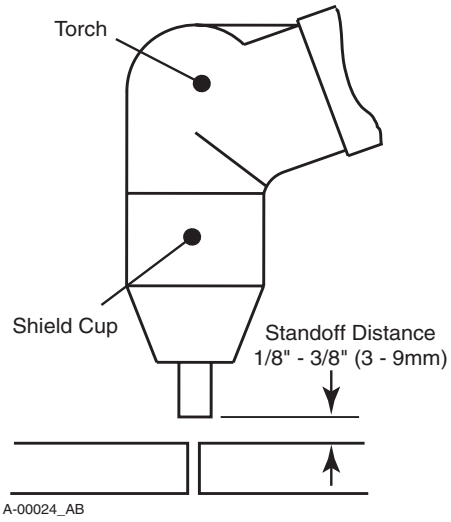
NOTE

The tip should never come in contact with the workpiece except during drag cutting operations.

B. Depending on the cutting operation, do one of the following:

a). For drag cutting, place the tip on the plate holding the torch at a angle to the plate so that only one edge of the tip is in contact with the plate. This prevents damage to the tip during the piercing process.

b). For standoff cutting, hold the torch tip on the work piece, pull the trigger. After the arc is initiated lift the tip to 1/8" - 3/8" (3-4mm) off the work.



Standoff Distance

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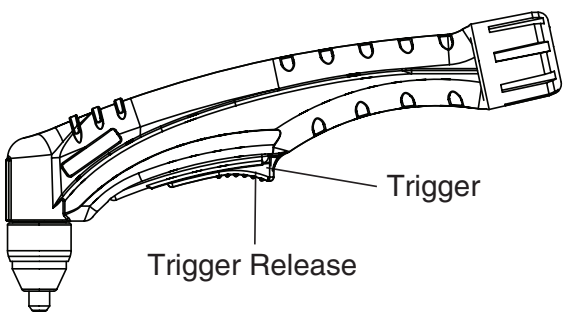
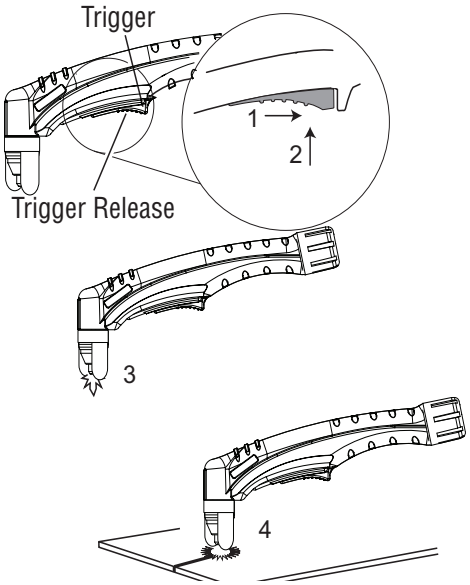




NOTE

When the shield cup is properly installed, there is a slight gap between the shield cup and the torch handle. Gas vents through this gap as part of normal operation. Do not attempt to force the shield cup to close this gap. Forcing the shield cup against the torch head or torch handle can damage components.

- **Drag Cutting With a Hand Torch**
  Drag cutting works best on metal 1/4"(6 mm) thick or less.

NOTE

For best parts performance and life, always use the correct parts for the type of operation.

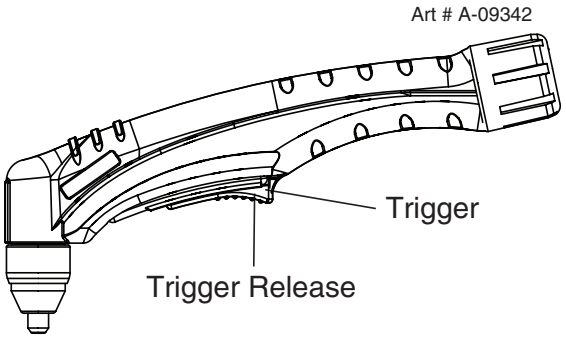
A. Install the drag cutting tip and set the output current.

B. The torch can be comfortably held in one hand or steadied with two hands. Position the hand to press the Trigger on the torch handle. With the hand torch, the hand may be positioned close to the torch head for maximum control or near the back end for maximum heat protection. Choose the holding technique that feels most comfortable and allows good control and movement.

C. Keep the torch in contact with the workpiece during the cutting cycle.

D. Hold the torch away from your body.

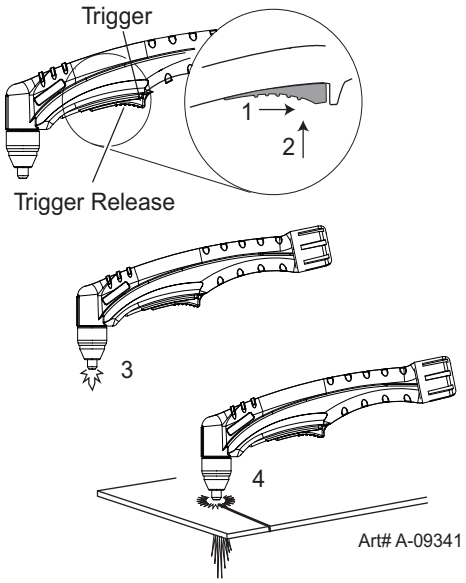
E. Slide the trigger release toward the back of the torch handle while simultaneously squeezing the trigger. The arc will start.



F. Place the torch tip on the work. The main arc will transfer to the work.

NOTE

The gas preflow and postflow are a characteristic of the power supply and not a function of the torch.



G. Cut as usual. Simply release the trigger assembly to stop cutting.

H. Follow normal recommended cutting practices as provided herein.

3. Complete cutting operation.

NOTE

If the torch is lifted too far from the workpiece while cutting, the main arc will stop and the pilot arc will automatically restart.

4. Release the torch trigger.
   a. Main arc stops.
5. Set the power supply ON / OFF switch to OFF (down position).
   a. AC indicator ~ turns OFF.
6. Set the main power disconnect to OFF, or unplug input power cord.
   a. Input power is removed from the system.

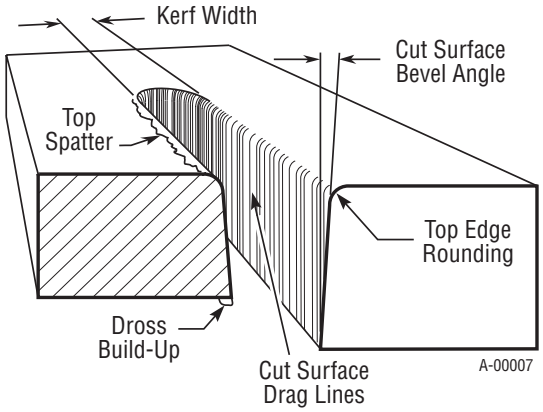
4.04 Cut Quality

NOTE

Cut quality depends heavily on setup and parameters such as torch standoff, alignment with the workpiece, cutting speed, gas pressures, and operator ability.

Refer to appendix pages for additional information as related to the power supply used.

Cut quality requirements differ depending on application. For instance, nitride build-up and bevel angle may be major factors when the surface will be welded after cutting. Dross-free cutting is important when finish cut quality is desired to avoid a secondary cleaning operation. The following cut quality characteristics are illustrated in the following figure:



Cut Quality Characteristics

Cut Surface

The desired or specified condition (smooth or rough) of the face of the cut.

Nitride Build - Up

Nitride deposits can be left on the surface of the cut when nitrogen is present in the plasma gas stream. These buildups may create difficulties if the material is to be welded after the cutting process.

Bevel Angle

The angle between the surface of the cut edge and a plane perpendicular to the surface of the plate. A perfectly perpendicular cut would result in a 0° bevel angle.

Top - Edge Rounding

Rounding on the top edge of a cut due to wearing from the initial contact of the plasma arc on the workpiece.

Bottom Dross Buildup

Molten material which is not blown out of the cut area and resolidifies on the plate. Excessive dross may require secondary cleanup operations after cutting.

Kerf Width

The width of the cut (or the width of material removed during the cut).

Top Spatter (Dross)

Top spatter or dross on the top of the cut caused by slow travel speed, excess cutting height, or cutting tip whose orifice has become elongated.

4.05 General Cutting Information

WARNING

Disconnect primary power at the source before disassembling the power supply, torch, or torch leads.

Frequently review the Important Safety Precautions at the front of this manual. Be sure the operator is equipped with proper gloves, clothing, eye and ear protection. Make sure no part of the operator's body comes into contact with the workpiece while the torch is activated.

CAUTION

Sparks from the cutting process can cause damage to coated, painted, and other surfaces such as glass, plastic and metal.

NOTE

Handle torch leads with care and protect them from damage.

Torch Standoff

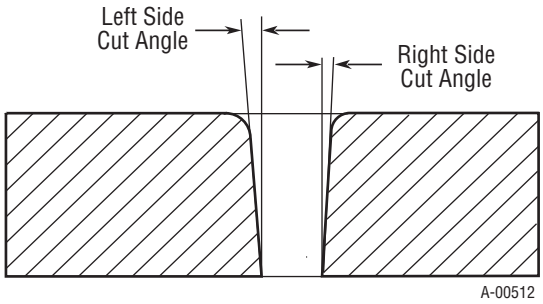
Improper standoff (the distance between the torch tip and workpiece) can adversely affect tip life as well as shield cup life. Standoff may also significantly affect the bevel angle. Reducing standoff will generally result in a more square cut.

Edge Starting

For edge starts, hold the torch perpendicular to the workpiece with the front of the tip near (not touching) the edge of the workpiece at the point where the cut is to start. When starting at the edge of the plate, do not pause at the edge and force the arc to "reach" for the edge of the metal. Establish the cutting arc as quickly as possible.

Direction of Cut

In the torches, the plasma gas stream swirls as it leaves the torch to maintain a smooth column of gas. This swirl effect results in one side of a cut being more square than the other. Viewed along the direction of travel, the right side of the cut is more square than the left.



Side Characteristics Of Cut

To make a square - edged cut along an inside diameter of a circle, the torch should move counterclockwise around the circle. To keep the square edge along an outside diameter cut, the torch should travel in a clockwise direction.

Dross

When dross is present on carbon steel, it is commonly referred to as either "high speed, slow speed, or top dross". Dross present on top of the plate is normally caused by too great a torch to plate distance. "Top dross" is normally very easy to remove and can often be wiped off with a welding glove. "Slow speed dross" is normally present on the bottom edge of the plate. It can vary from a light to heavy bead, but does not adhere tightly to the cut edge, and can be easily scraped off. "High speed dross" usually forms a narrow bead along the bottom of the cut edge and is very difficult to remove. When cutting a troublesome steel, it is sometimes useful to reduce the cutting speed to produce "slow speed dross". Any resultant cleanup can be accomplished by scraping, not grinding.

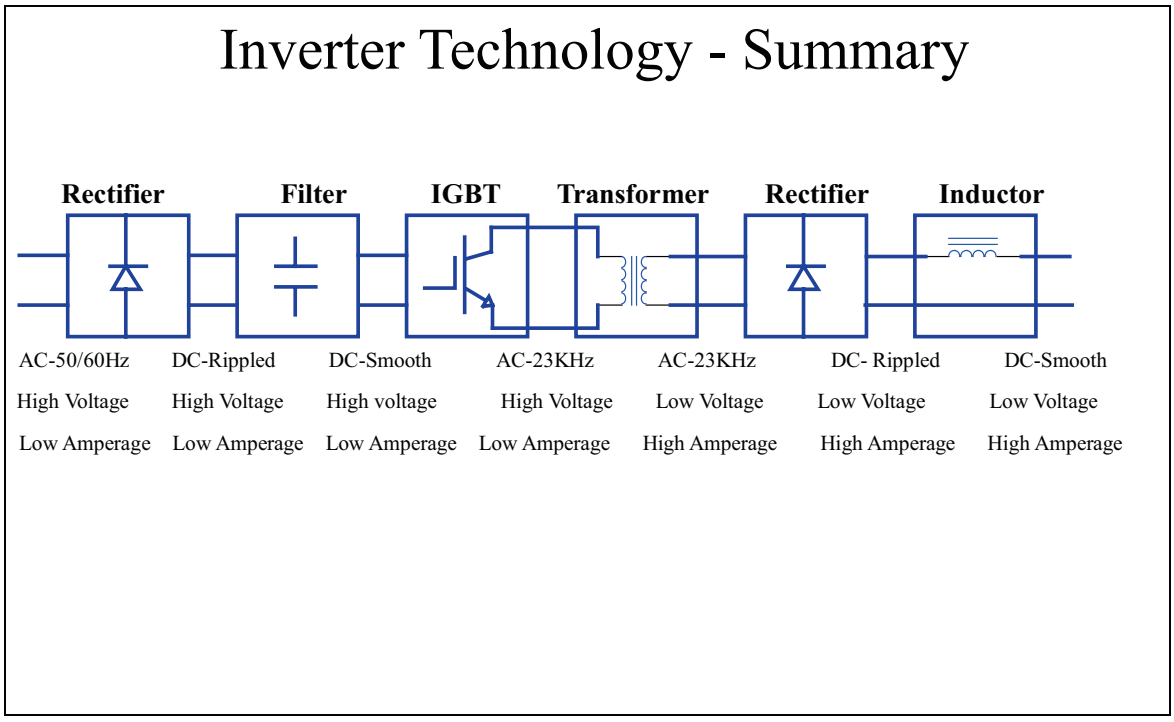
Notes

SECTION 5:
THEORY OF OPERATION

5.01 Inverter Design

What does the word inverter mean?

The term inverter refers to the ability to change DC power into AC. Inverter power supplies immediately rectify the incoming AC to DC, and then the transistors create a higher frequency AC. The higher frequency AC then goes on to a much smaller main transformer than in a conventional power supply. The AC is then rectified to extremely smooth DC. The diagram to the below shows the basic electrical wiring of a DC output inverter power supply.



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Notes

SECTION 6: TROUBLESHOOTING

6.01 Basic Troubleshooting-Power Source Faults

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair it unless you are an accredited service provider and you have had training in power electronics measurement and troubleshooting techniques.

Common Faults symptom LED Indicators

A. AC indicator ~ OFF

1. Main input power cord does not connect to power distribution net.
    a. Connect the power cord.
2. Power ON/OFF switch in OFF (down) position.
    a. Turn switch to ON (up) position.
3. Actual input voltage does not correspond to voltage of unit.
    a. Verify that the input line voltage is correct.
4. Faulty components in unit
    a. Return for repair or have qualified technician repair per service manual.

B. AC indicator ~ blinking

1. Indicator blinking (1 sec ON/1 Sec OFF, Gas may also pulse 3 times).
    a. Check for missing torch parts or not properly installed. Turn ON/OFF switch to OFF position and restart the machine by turning the power switch to ON.
2. Indicator blinking (1 sec ON/3 Sec OFF).
    a. Check for worn or sticking torch parts. Replace if necessary.
3. Indicator blinking (3 sec ON/3 Sec OFF).
    a. Torch switch was depressed before machine was completely powered up. Turn ON/OFF switch to OFF position and the restart the machine by turning the power switch to ON.

C. Air indicator OFF

1. Gas pressure too low. Check supply pressure.

D. TEMP indicator ON, (AC indicator ~ ON)

1. Unit air flow obstructed.
    a. Check for blocked air flow around the unit and correct condition.
2. Fan blocked.
    a. Check for blocked status and correct condition.
3. Unit is overheated.
    a. Keep the machine plugged in and turned on for five minutes. This will allow the fan to run and cool the machine.

4. Faulty components in unit
    a. Return for repair or have qualified technician repair per service manual.

E. Torch will not pilot, when torch trigger is activated.

1. Faulty parts in torch
    a. Check torch parts per section 4.02; replace as needed.
2. Gas pressure too low
    a. Adjust supply pressure to proper setting value.

NOTE

The pressure should be set at (100 PSI).

3. Faulty components in unit
    a. Return for repair or have qualified technician repair per service manual.

F. No cutting output when torch is activated; AC indicator ~ ON, gas flows, fan turns.

1. Torch is not connected properly to power supply.
    a. Check torch connection to power supply.
2. Working cable not connected to work piece, or connection is poor.
    a. Make sure that work cable has a proper connection to a clean, dry area of the work piece.
3. Faulty components in unit
    a. Return for repair or have qualified technician repair per service manual.
4. Faulty torch
    a. Return for repair or have qualified technician repair.

G. Torch cuts but not adequately

1. Incorrect setting of output current control
    a. Check and adjust to proper setting.
2. Working cable connection to work piece is poor.
    a. Make sure that work cable has a proper connection to a clean, dry area of the work piece.
3. Faulty components in unit
    a. Return for repair or have qualified technician repair.

H. Output is restricted, and can not be controlled.

1. Input or output connection is poor.
    a. Check all input and output connection leads.
2. Working cable connection to work piece is poor.
    a. Make sure that work cable has a proper connection to a clean, dry area of the work piece.
3. Faulty components in unit
    a. Return for repair or have qualified technician repair per service manual.

I. Cutting output is unstable or inadequate at 120V operation.

1. Low or fluctuating input voltage
    a. Turn output current to minimum (20 amps) and suggest using 20A Drag tip.
    b. Connect to a dedicated input line voltage.
    c. Have electrician check input line voltage under load.

2. Input or output connection is poor

    a. Check all input and output connection leads.

3. Working cable connection is poor.

    a. Make sure that work cable has a proper connection to a clean, dry area of the work piece.

J. Hard to startup

1. Torch parts worn (consumables)

    a. Turn off input power, remove shield cup, tip, start cartridge, and electrode and check them all. If the electrode or cutting tip is worn out, replace them. If the start cartridge does not move freely, replace it. If there is too much spatter on shield cup, replace it.

K. Arc goes out while operating. Arc can't be restarted when torch trigger is activated.

1. Power Supply is overheated (TEMP indicator ON).

    a. Let unit cool down for at least 5 minutes. Make sure the unit has not been operated beyond duty cycle limit.

2. Fan blades blocked (TEMP indicator ON).

    a. Check and clear blades.

3. Air flow blocked

    a. Check for blocked air flow around the unit and correct condition.

4. Gas pressure is too low. (Air indicator ON when torch trigger is activated.)

    a. Check gas source. Adjust to proper setting value.

5. Torch parts worn

    a. Check torch shield cup, cutting tip, start cartridge and electrode. Replace as needed.

6. Faulty component in unit

    a. Return for repair or have qualified technician repair per service manual.

L. Torch cuts but not well.

1. Current control is set too low.

    a. Increase the current setting.

2. Torch is being moved too fast across work piece

    a. Reduce cutting speed.

3. Excessive oil or moisture in torch

    a. Hold torch 1/8 inch (3 mm) from clean surface while purging and observe oil or moisture buildup (do not activate torch). If there are contaminants in the gas, additional filtering may be needed.

4. Torch parts worn

    a. Check torch shield cup, cutting tip, start cartridge and electrode. Replace as needed.

M. Gas in torch pulsates 3 times and then stops. AC indicator light blinking.

1. Torch parts not properly installed in torch. There may have been an attempt to remove torch parts without turning off ON/OFF power switch to OFF on unit.

    a. Check to make sure torch parts are properly installed.

    b. Turn ON/OFF switch to OFF and then back to ON.

6.02 Inspection and Replacement of Consumable Torch Parts

WARNING

Disconnect primary power to the system before disassembling the torch or torch leads.

DO NOT touch any internal torch parts while the AC indicator light of the Power Supply is ON.

Remove the consumable torch parts as follows:

NOTE

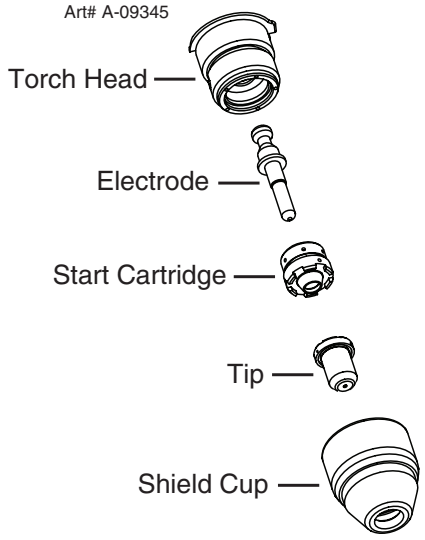
The shield cup holds the tip and starter cartridge shield cup in place. Position the torch with the shield cup facing upward to prevent these parts from falling out when the cup is removed.

1. Unscrew and remove the shield cup from the torch.

NOTE

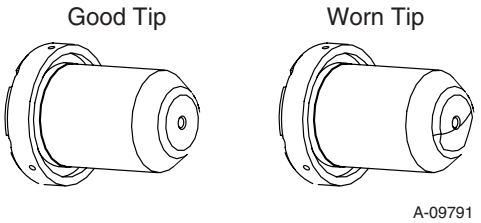
Slag built up on the shield cup that cannot be removed may effect the performance of the system.

2. Inspect the cup for damage. Wipe it clean or replace if damaged.



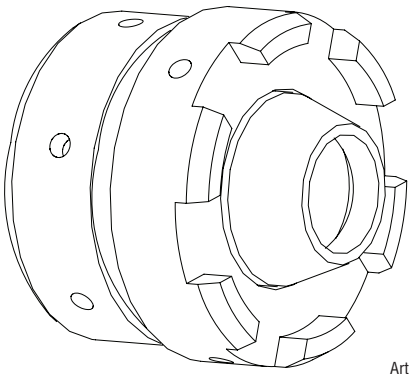
Consumable Parts

3. Remove the tip. Check for excessive wear (indicated by an elongated or oversized orifice). Clean or replace the tip if necessary.

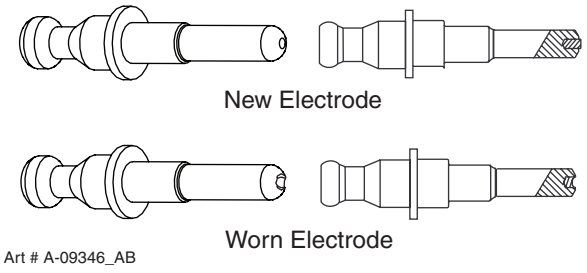


Tip Wear

4. Remove the starter cartridge. Check for excessive wear, plugged gas holes, or discoloration. Check the lower end fitting for free motion. Replace if necessary.



5. Pull the electrode straight out of the torch head. Check the face of the electrode for excessive wear. Refer to the following figure.

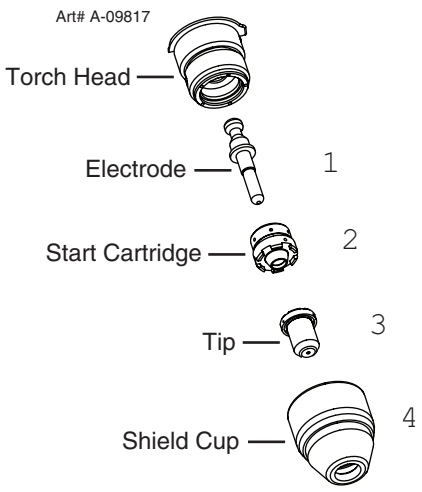


Electrode Wear

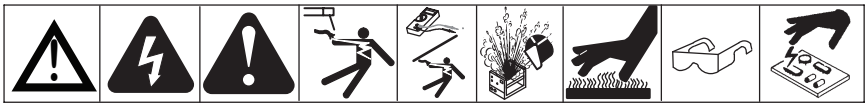
6. Reinstall the electrode by pushing it straight into the torch head until it clicks.
7. Reinstall the desired starter cartridge and tip into the torch head.
8. Hand tighten the shield cup until it is seated on the torch head. If resistance is felt when installing the cup, check the threads before proceeding.

SL40 Replacement Parts

Item #	Description	Cat. No
1	Electrode	9-0096
2	Start Cartridge	9-0097
3	Tip, 20A Drag	9-0091
	Tip, 40A Drag	9-0093
	Tip, 40A Standoff	9-0094
4	Shield Cup	9-0098
N/S	SL40 Torch w/ 15ft (4.6m) leads	7-0040



6.03 Checking Unit Before Applying Power



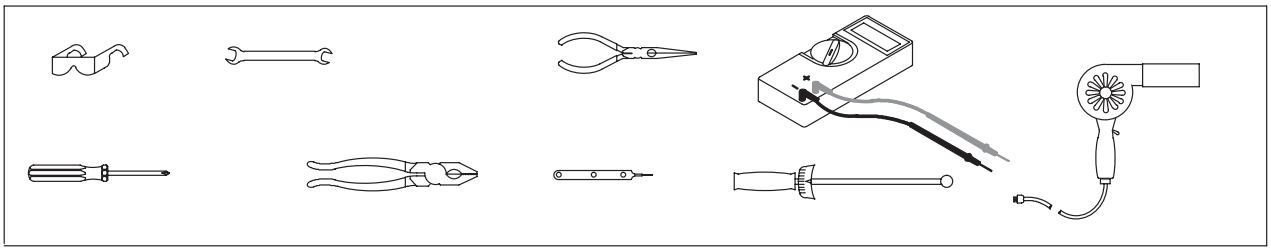
Turn SW1 to OFF position, and disconnect unit from primary line voltage before working on unit.

Significant DC voltage can remain on capacitors after unit is Off. Wait until all front panel LED's are off before removing case.

Check DC bus voltage according to Section 6.08 after removing case.

Before troubleshooting or applying power to unit, complete the following checks to avoid causing further damage.

6.04 Tools Needed for Troubleshooting and Servicing

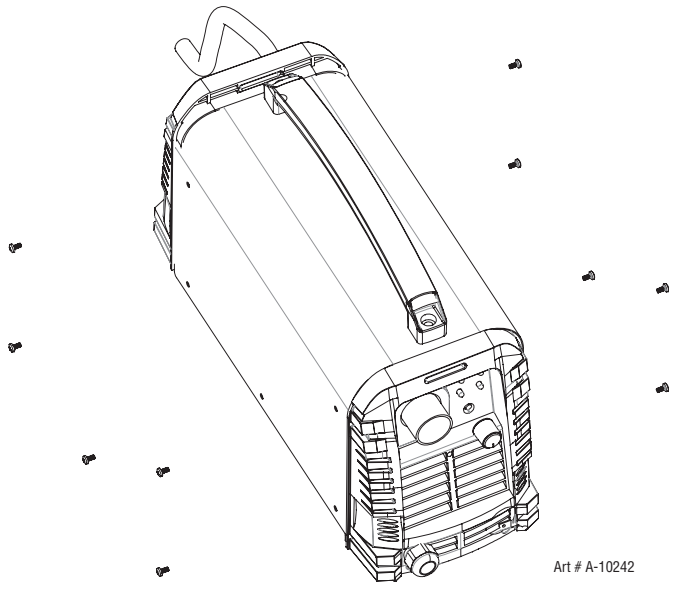


Art # A-09849

6.05 Case Removal

Read and follow safety information in Section 6.03 before proceeding.

Remove the ten screws from the cover and remove the cover panel.



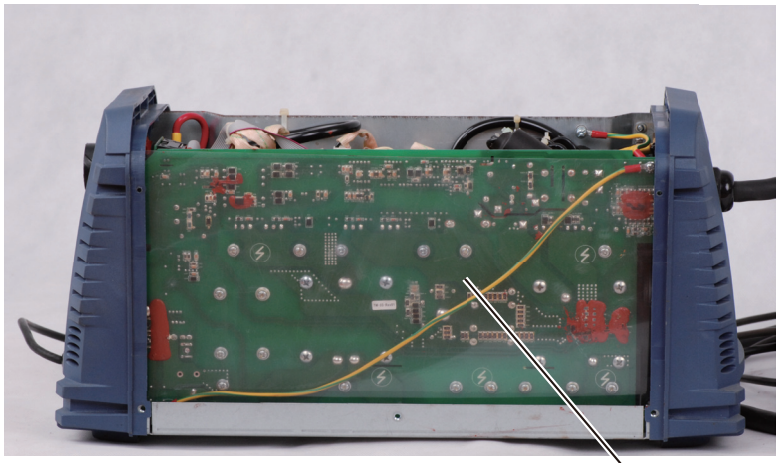
Art # A-10242

6.06 Clear Cover Sheet Removal

Read and follow safety information in Section 6.03 before proceeding.

1. Clear protective sheet

Take out clear protective sheet.



6.07 Visually Inspect

Visually inspect the inside of the Power Source. The levels of current present in these units can cause burning or arcing of PCB, transformers, switches, or rectifier when a failure occurs. Carefully inspect all components within these units.

Look in particular for the following:

a) Loose or broken wires or connectors.

b) Burned or scorched parts or wires or evidence of arcing.

c) Any accumulation of metal dust or filings that may have caused shorting or arcing.

If any parts are damaged, they must be replaced. Refer to the Spare Parts section for a complete list of components used in the Power Source.

Locate the faulty component(s) then replace where necessary.

6.08 Preliminary DC Bus Measurement of the Main Inverter Board

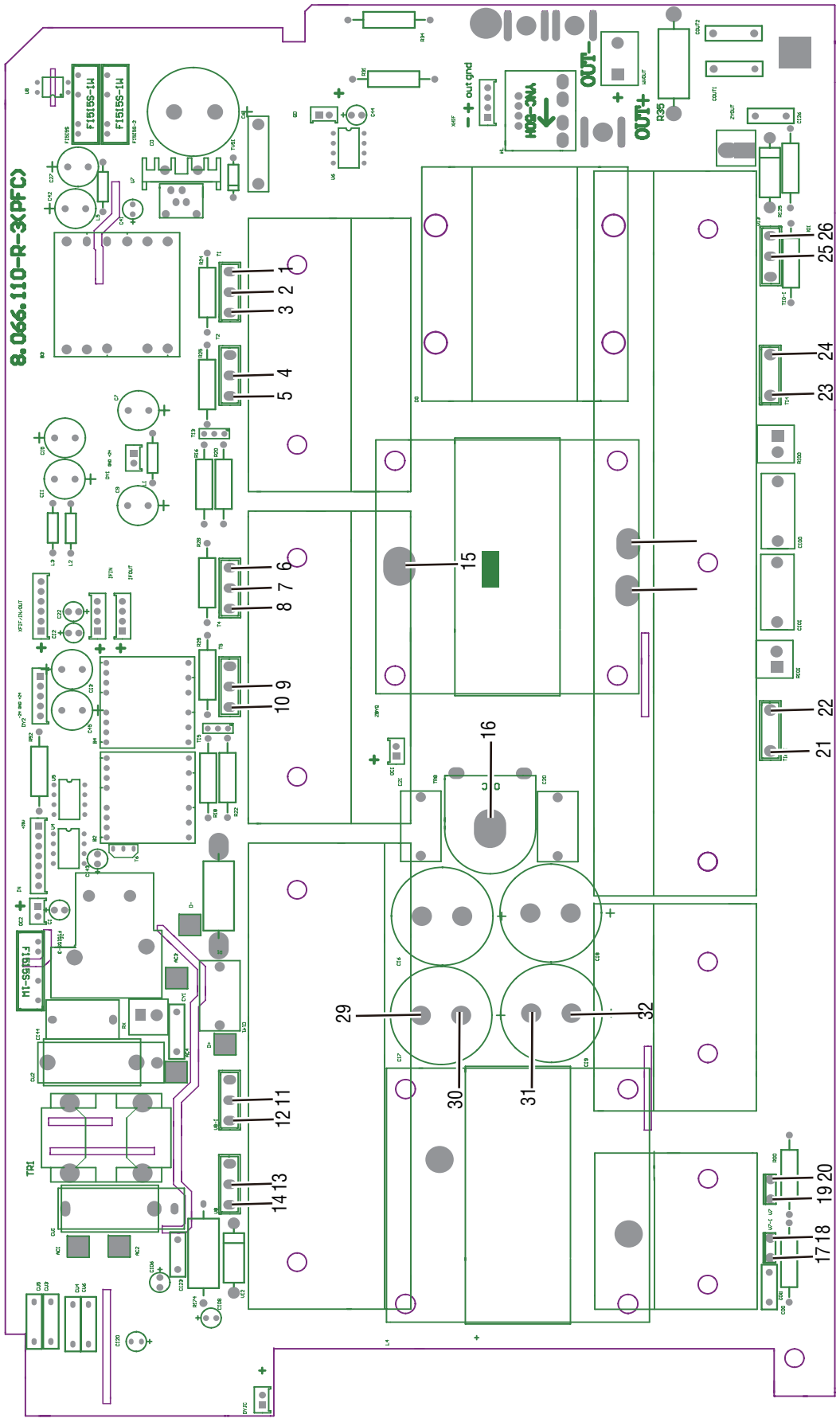
Read and follow safety information in Section 6.03 before proceeding.

DC Bus Testing	Multimeter Lead Placement	Voltage with Supply voltage OFF
Upper capacitor bank	Positive meter lead to testpoint 30 Negative meter lead to testpoint 29	0 VDC
Lower capacitor bank	Positive meter lead to testpoint 32 Negative meter lead to testpoint 31	0 VDC

Table 6-1 DC BUS, Multimeter set to measure DC volts

6.09 Preliminary Check of the Main Inverter Board

Read and follow safety information in Section 6.03 before proceeding.

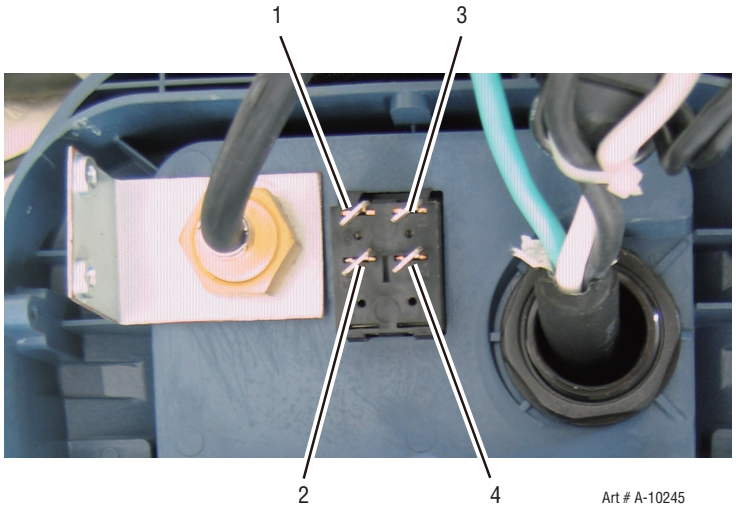


IGBT Testing	Multimeter Lead Placement	Diode Voltage
IGBT 1	Positive meter lead to test point 3	0.2000 to 0.8000 VDC
	Negative meter lead to test point 2	
IGBT 2	Positive meter lead to test point 5	0.2000 to 0.8000 VDC
	Negative meter lead to test point 4	
IGBT 3	Positive meter lead to test point 8	0.2000 to 0.8000 VDC
	Negative meter lead to test point 7	
VIGBT 4	Positive meter lead to test point 10	0.2000 to 0.8000 VDC
	Negative meter lead to test point 9	
PFC IGBT 1	Positive meter lead to test point 14	0.2000 to 0.8000 VDC
	Negative meter lead to test point 13	
PFC IGBT2	Positive meter lead to test point 12	0.2000 to 0.8000 VDC
	Negative meter lead to test point 11	
PILOT IGBT1	Positive meter lead to test point 26	0.2000 to 0.8000 VDC
	Negative meter lead to test point 25	

Table 6-2 IGBT's, Multimeter set to measure Diode Voltage

6.10 Check Main On / Off Switch

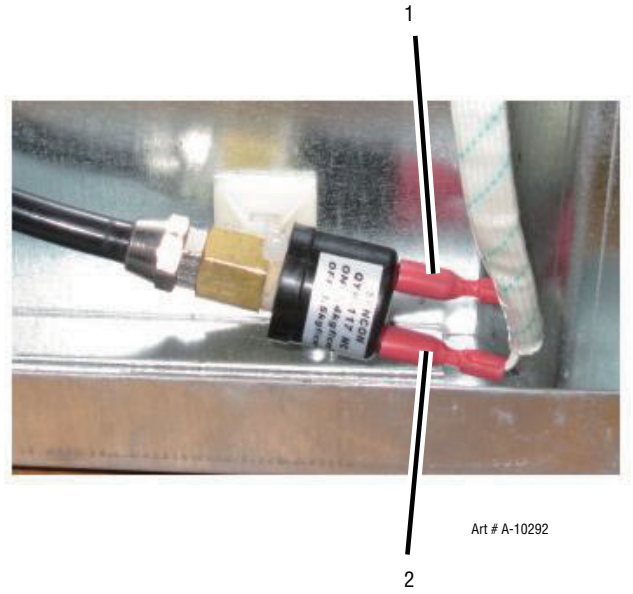
Read and follow safety information in Section 6.03 before proceeding.



Power Switch Testing	Multimeter Lead Placement	Impedance
Switch ON	Positive meter lead to testpoint 1 Negative meter lead to testpoint 2	0 to 1 Ω
Switch ON	Positive meter lead to testpoint 3 Negative meter lead to testpoint 4	0 to 1 Ω
Switch OFF	Positive meter lead to testpoint 1 Negative meter lead to testpoint 2	> 1k Ω
Switch OFF	Positive meter lead to testpoint 3 Negative meter lead to testpoint 4	> 1k Ω

Table 6-3 Power Switch, Multimeter set to measure ohms (Ω)

6.11 Check Pressure Switch



1. Pressure switch open

When the pressure is up to 3.5kgf/cm^2 (49.78 PSI), the pressure switch turns off.

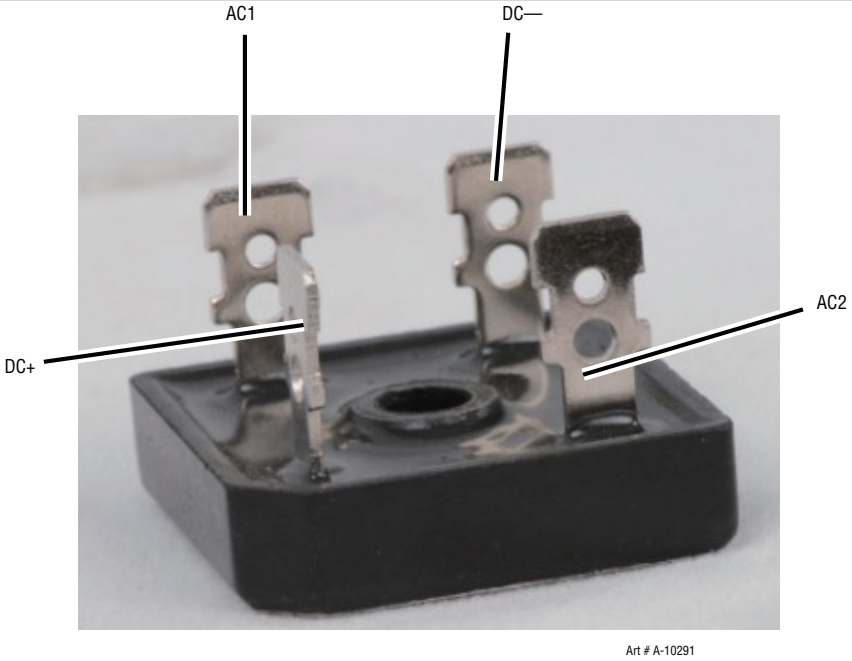
2. Pressure switch closed

When the pressure is less than 2.4kgf/cm^2 (34.13 PSI), the pressure switch turns on and the resistance between 1 and 2 is about 0.1Ω.

6.12 Check Regulator

When solenoid valve is on,adjusts the knob 1. If the pressure is continuously adjustable, the regulator is ok.

6.13 Check Main Input Rectifier



Input Rectifier Testing	Multimeter Lead Placement	Diode Voltage
AC1 to DC+	Positive meter lead to AC1 Negative meter lead to testpoint DC+	0.2 – 0.8 VDC
AC2 to DC+	Positive meter lead to AC2 Negative meter lead to testpoint DC+	0.2 – 0.8 VDC
AC1 to DC-	Positive meter lead to testpoint DC- Negative meter lead to testpoint AC1	0.2 – 0.8 VDC
AC2 to DC-	Positive meter lead to testpoint DC- Negative meter lead to testpoint AC2	0.2 – 0.8 VDC

Table 6-4 IGBT's, Multimeter set to measure Diode Voltage

Measurements may be made directly onto the main input rectifier. AC1 and AC2 may be measured from the pins on the mains supply plug with the main power switch set to the ON position.

6.14 DC Bus Voltage Measurement

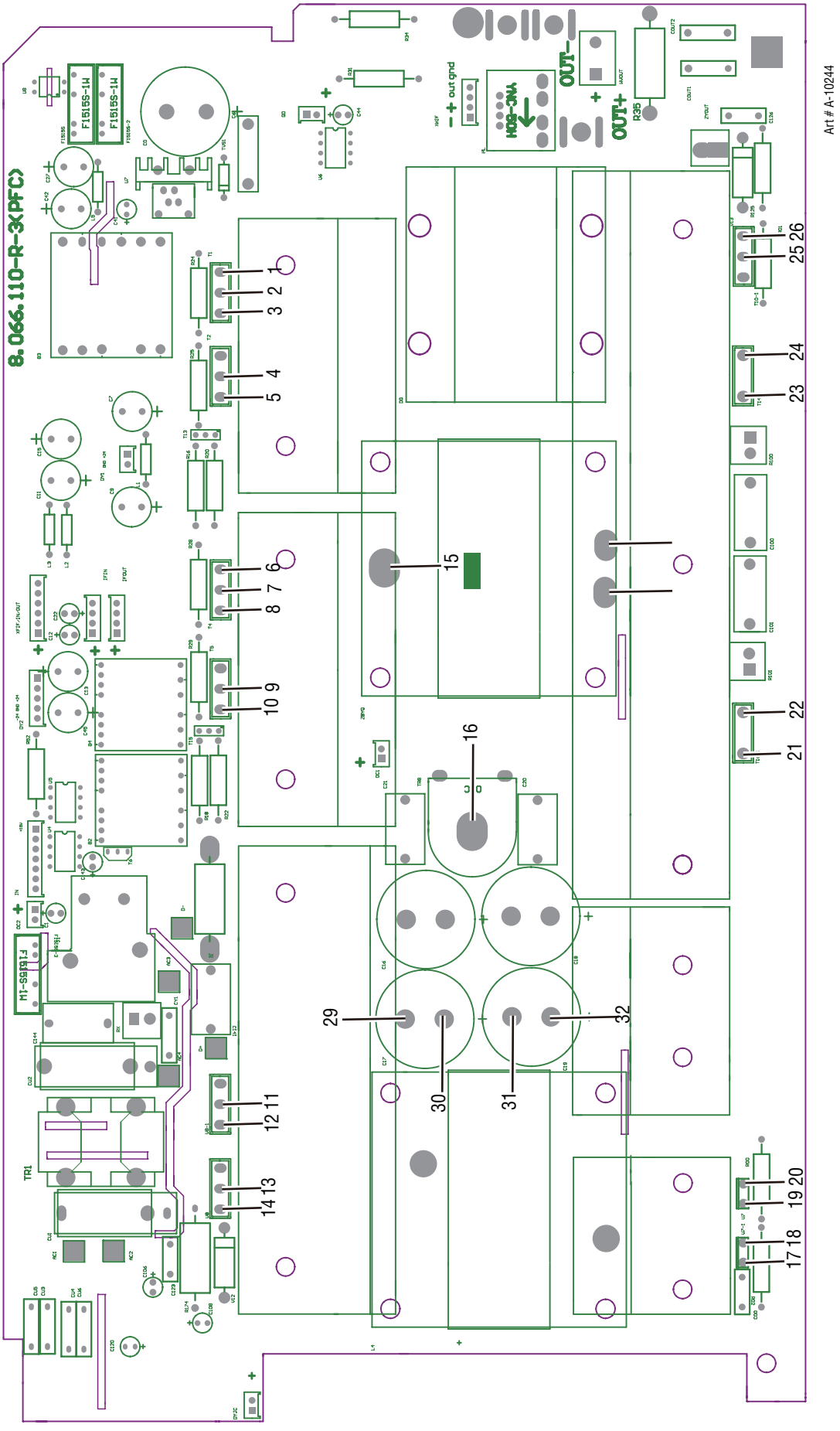
Apply voltage to the Power Source.

There are extremely dangerous voltage and power levels present inside these Power Sources.

Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

Once power is applied to the Power Source, there are extremely hazardous voltage and power levels present.

Do not touch any live parts.


8.066.110-R-3X(PFC)
Art # A-10244
OUT–
OUT+
– + out gnd
F15155-1W
F15155-1W
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
29
30
31
32
TR1

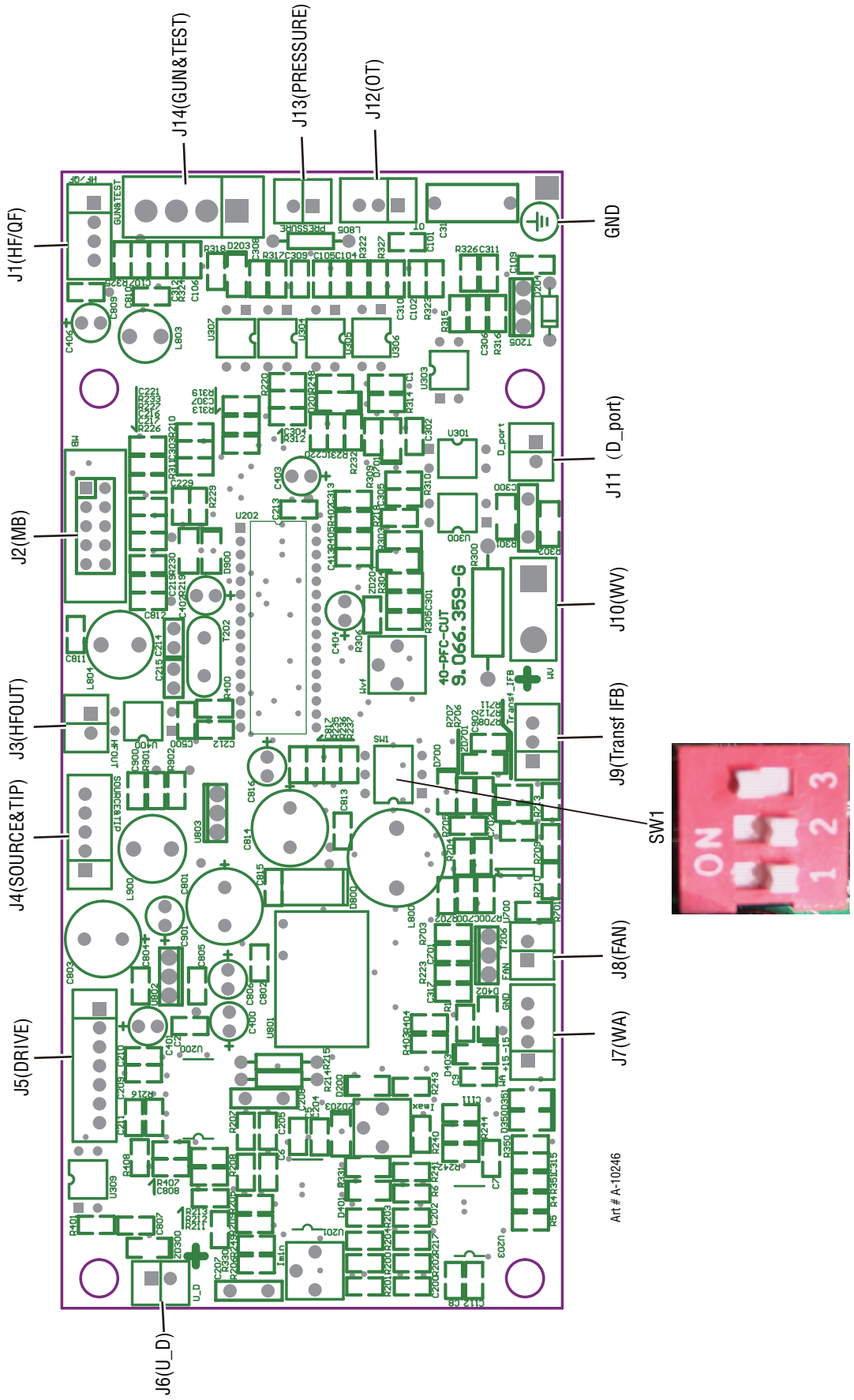
DC Bus Testing	Multimeter Lead Placement	Voltage with Supply voltage ON
Upper capacitor bank	Positive meter lead to testpoint 30 Negative meter lead to testpoint 29	192 VDC +/-10%
Lower capacitor bank	Positive meter lead to testpoint 31 Negative meter lead to testpoint 32	192 VDC +/-10%
Overall capacitor bank	Positive meter lead to testpoint 29 Negative meter lead to testpoint 32	384 VDC +/-10%

Table 6-5 DC BUS, Multimeter set to measure DC volts

Note: These DC voltages are at nominal mains supply voltage of 240VAC.

6.15 Check of Control PCB

Read and follow safety information in Section 6.03 before proceeding.



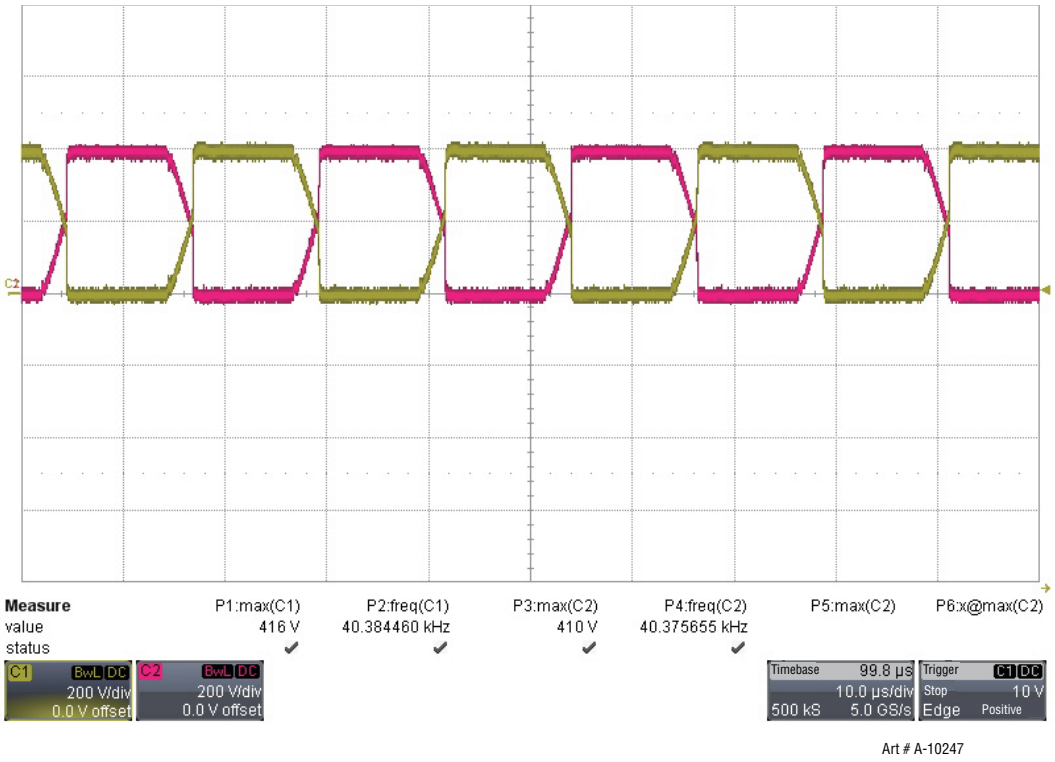
J1	Pin function	Signal
1	GND	0VDC
2	Control circuit power source	27VDC
3	Negative of solenoid control signal	0VDC (when solenoid is on)
4	Positive of solenoid control signal	27VDC
J2		
1	Current control potentiometer	0—4VDC
2	N/A	N/A
3	Fault indicator signal	2vdc (when indication lights up)
4	N/A	N/A
5	Control circuit power supply	5VDC
6	GND	0VDC
7	Power indication signal	2VDC
8	N/A	N/A
9	Work indication signal	2VDC
10	Power indication signal	2VDC
J3	N/A	N/A
J4		
1	Positive of TIP test signal	5VDC
2	TIP test signal	5VDC (when the machine dose no work);0VDC (when the machine is woking)
3	Control circuit power source	24VDC
4	GND	0VDC
5	Control circuit power source	-24VDC
J5		
1	Drive circuit power	+15VDC
2	IGBT 1 pwm drive signal	15V p-p square wave
3	IGBT 2 pwm drive signal	15V p-p square wave
4	IGBT 2 pwm drive signal	15V p-p square wave
5	IGBT 1 pwm drive signal	15V p-p square wave
6	Overcurrent signal	>7VDC (when over primary current protection)
7	GND	0VDC
J6		
1	Feedback of input voltage	41VDC(input 230vac) 23VDC(input 115vac)
2	GND	0VDC
J7		
1	Power source of current sensor	15VDC
2	Power source of current sensor	-15VDC
3	Output current feedback	
4	GND	0VDC
J8		

1	Power source of fan	24VDC
2	0VDC(fan negative)when fan is on	0VDC
J9		
1	Pilot ARC current feedback signal	-0.8VDC +5VDC(A main cutting arc is established)
2	GND	0VDC
3	N/A	N/A
J10		
1	Positive of voltage feedback	Machine output +
2	Negative of voltage feedback	Machine output _
J11		
1	+12VDC	+12VDC
2	Pilot ARC IGBT drive signal	
J12		
1	N/A	N/A
2	Thermostat (0VDC when thermostat closed)	
3	GND	0VDC
J13		
1	Pressure switch signal	0VDC (when switch closed otherwise 4VDC)
2	GND	0VDC
J14		
1	GND	0VDC
2	Gun switch signal	0VDC (when switch on otherwise 27VDC)
3	Cup test signal	0VDC
4	Cup test signal	0VDC (when the cup is fixed otherwise 27VDC)

6.16 Waveforms

1. Vds of inverter IGBT at no load

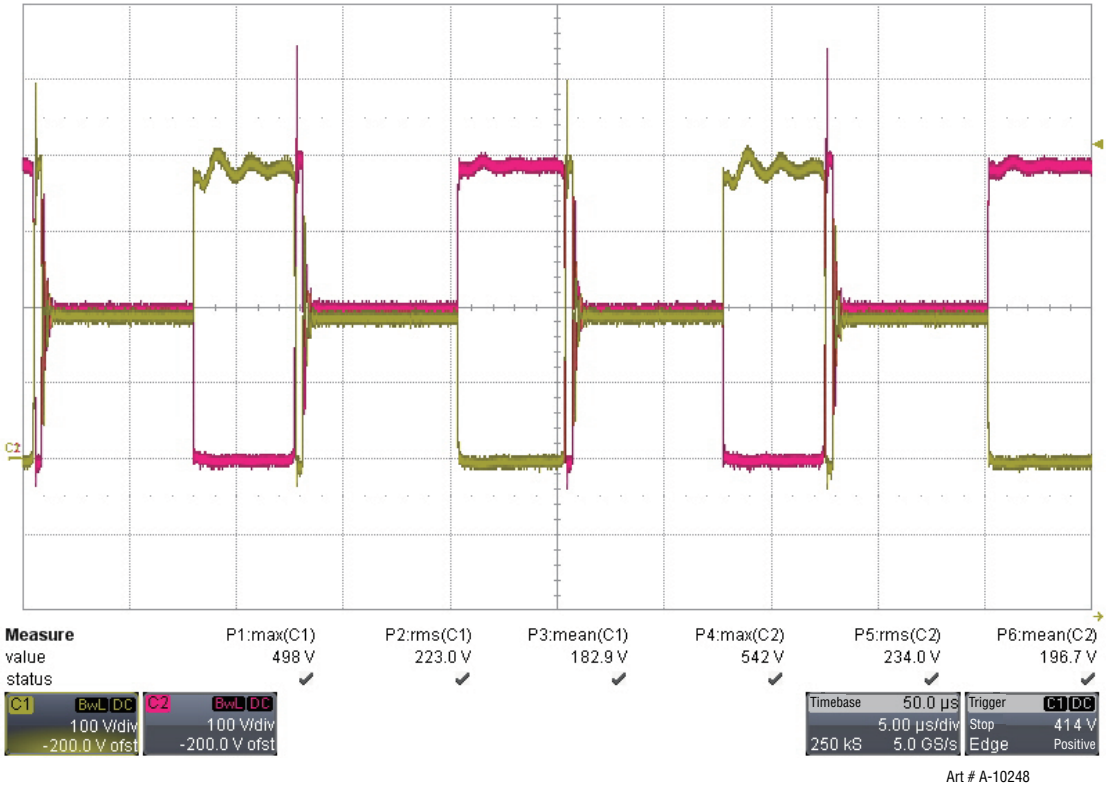
Test point C1: 4 and 5 C2: 9 and 10 (Testpoints refer to inverter PCB diagram in Sec. 6.13).



Art # A-10247

2. Vds of inverter IGBT at full load

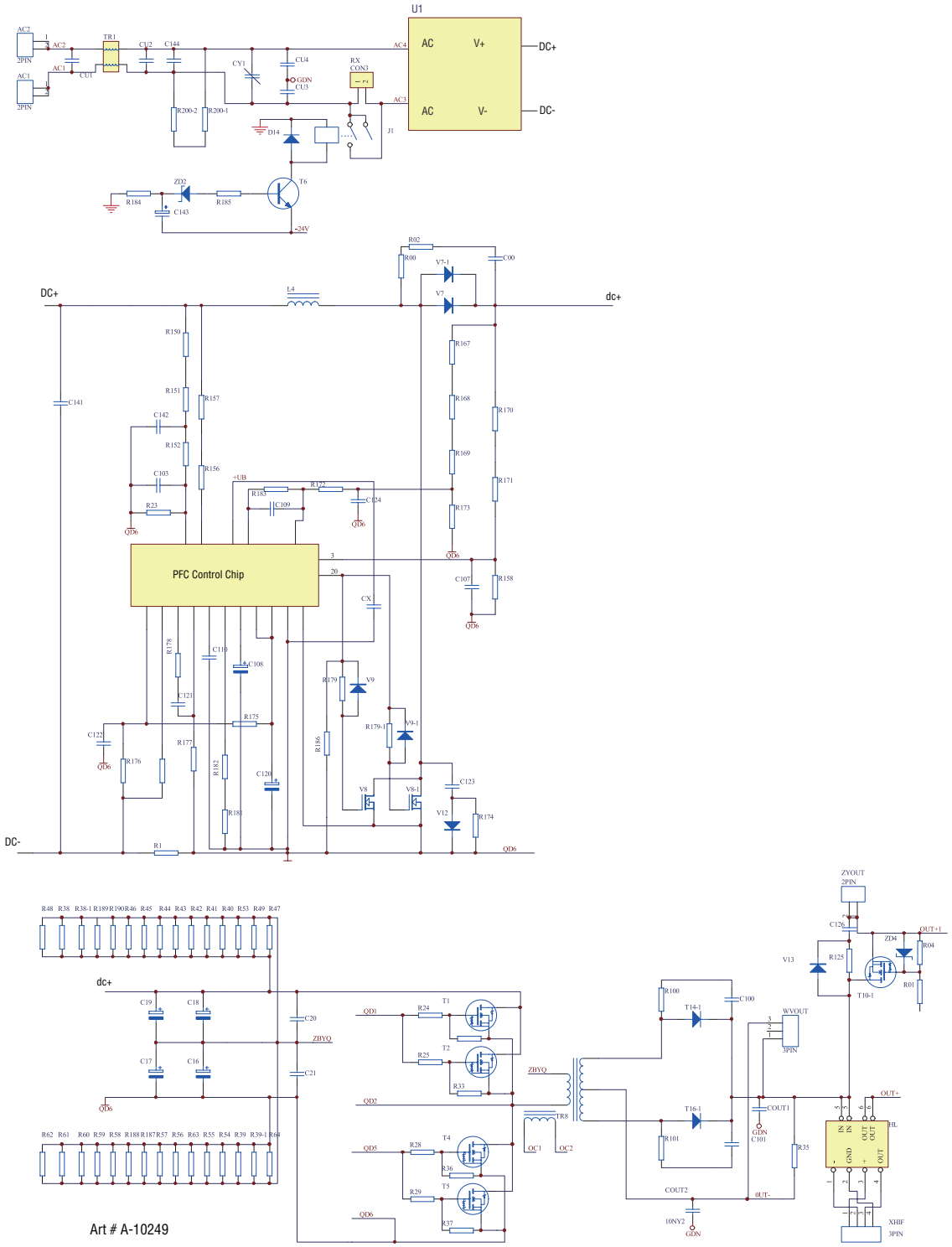
Test point C1: 4 and 5 C2: 9 and 10 (Testpoints refer to inverter PCB diagram in Sec. 6.13).



Art # A-10248

6.17 Main Circuit Description

Turn off power and disconnect mains supply plug from receptacle before working on the unit. Allow two minutes for capacitors to discharge after disconnection from mains supply voltage.



The mains supply voltage is connected via a double pole switch to the input rectifier U1 through an EMC filter. Overvoltage protection is provided by varistor CY1.

The rectifier circuit converts the input AC voltage to DC voltage. The input current is controlled by comparing with a reference waveform which is a pure sine wave derived from the source voltage. The PFC control chip will be used to generate suitable gate signal to drive V8,V8-1, ensuring the current is sinusoidal.

The boostdiode output charges the main capacitor bank (C16, C17, C18, C19, C20 and C21) to high voltage. Inrush current limiting is provided by a high power resistor which is then bypassed by relay J1 after a few seconds.

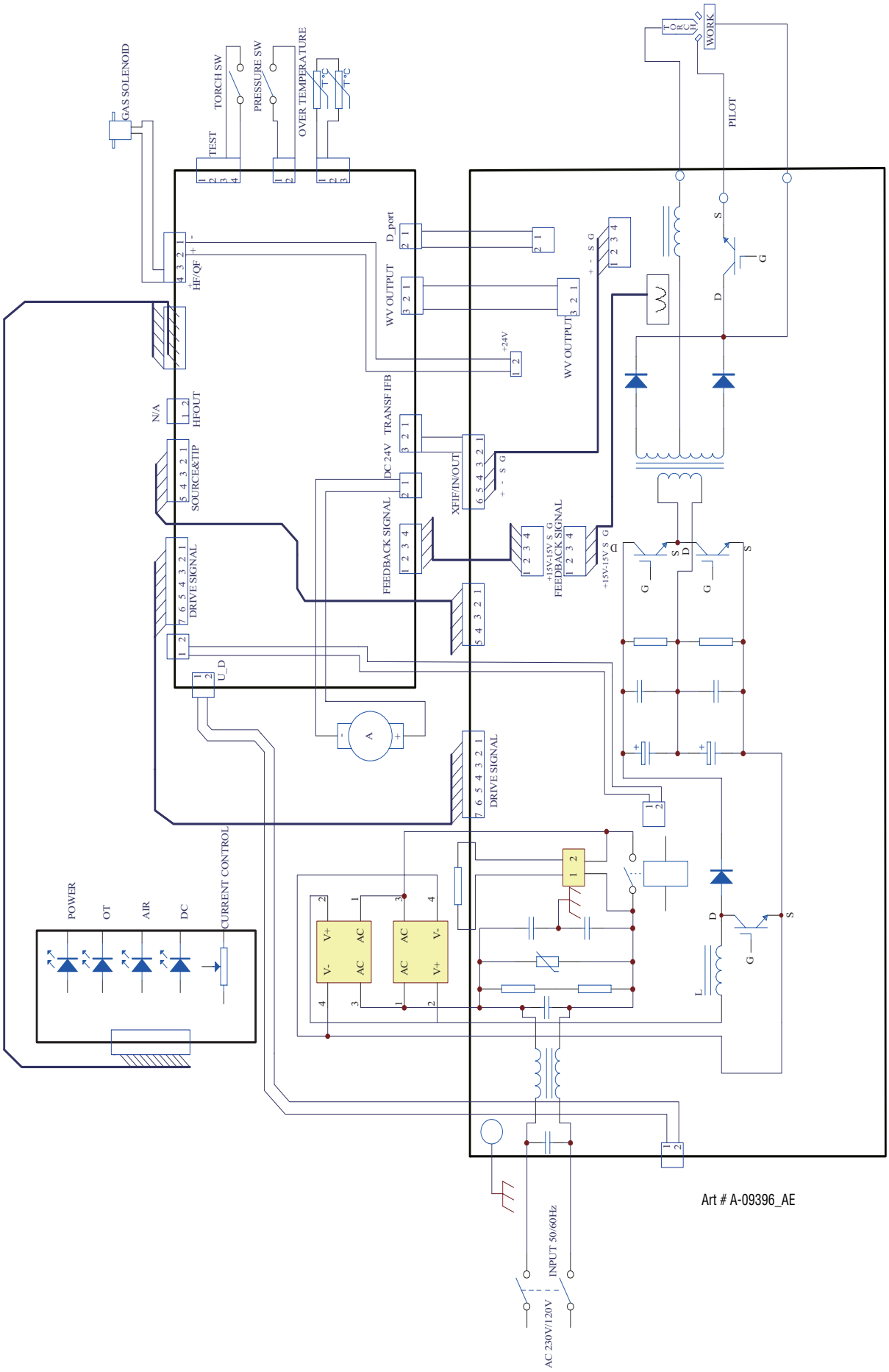
The primary igbt transistors (T1, T2, T4, and T5) switch the transformer primary at high frequency and varying duty cycle. The transformer return wire is taken from the junction of the capacitors C20 and C21 (the voltage at this point is approximately half the DC bus voltage).

Secondary output voltage from the transformer is rectified by the output diodes (T14-1 & T16-1) to DC. This DC is controlled by the PWM of the primary side igbt transistors, and is filtered by an inductor before connecting to the output terminals.

A thermal overload device (thermistor) is fixed to the rectifier heatsink. When an over temperature occurs, the control circuit inhibits the trigger and the output. The thermal overload indicator LED on the front panel is illuminated.

The current transformer TR8 provides a signal to the control circuit to indicate both transformer primary current, and also detect transformer saturation. The Hall effect current sensor is powered from regulated + & - 15VDC supplies and provides a voltage signal proportional to the output DC cutting current to allow the control circuit to regulate cutting current.

6.18 Circuit Diagram



SECTION 7:
DISASSEMBLY PROCEDURE

7.01 Safety Precautions for Disassembly

Read and follow safety information in Section 6.03 before proceeding.

Unplug unit before beginning Disassembly procedure.

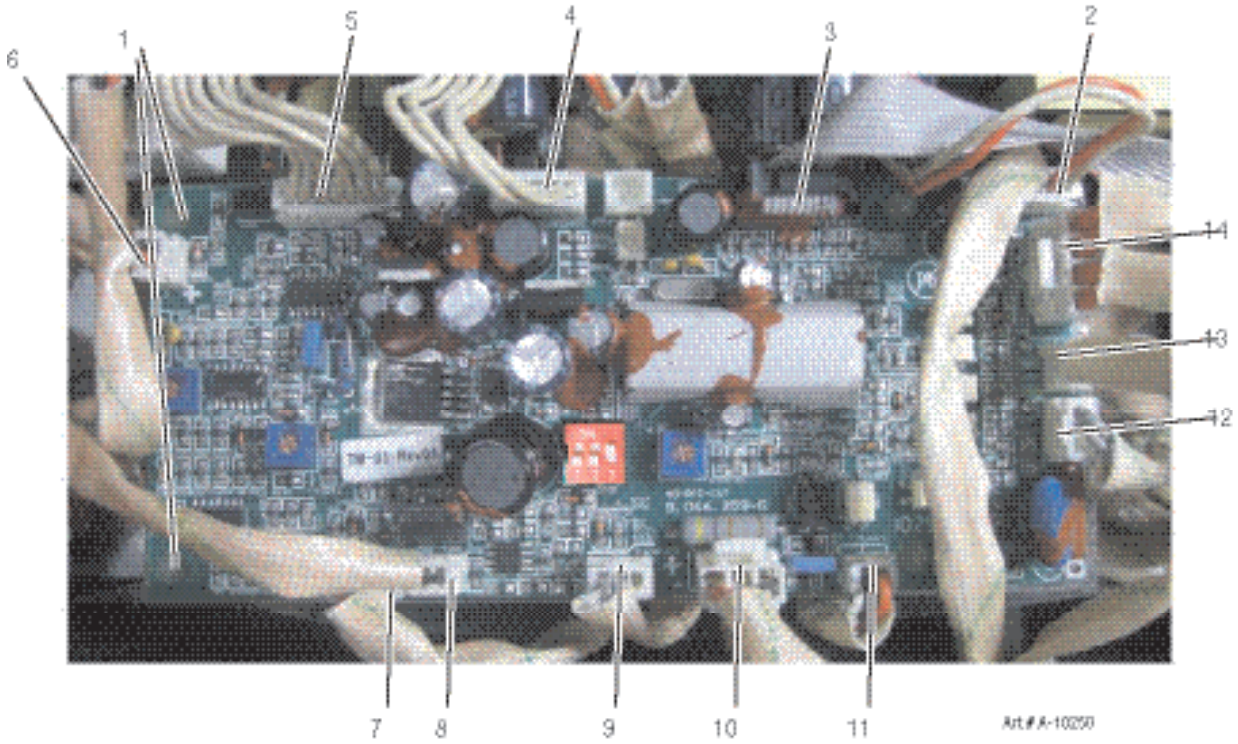
7.02 Control Board Removal

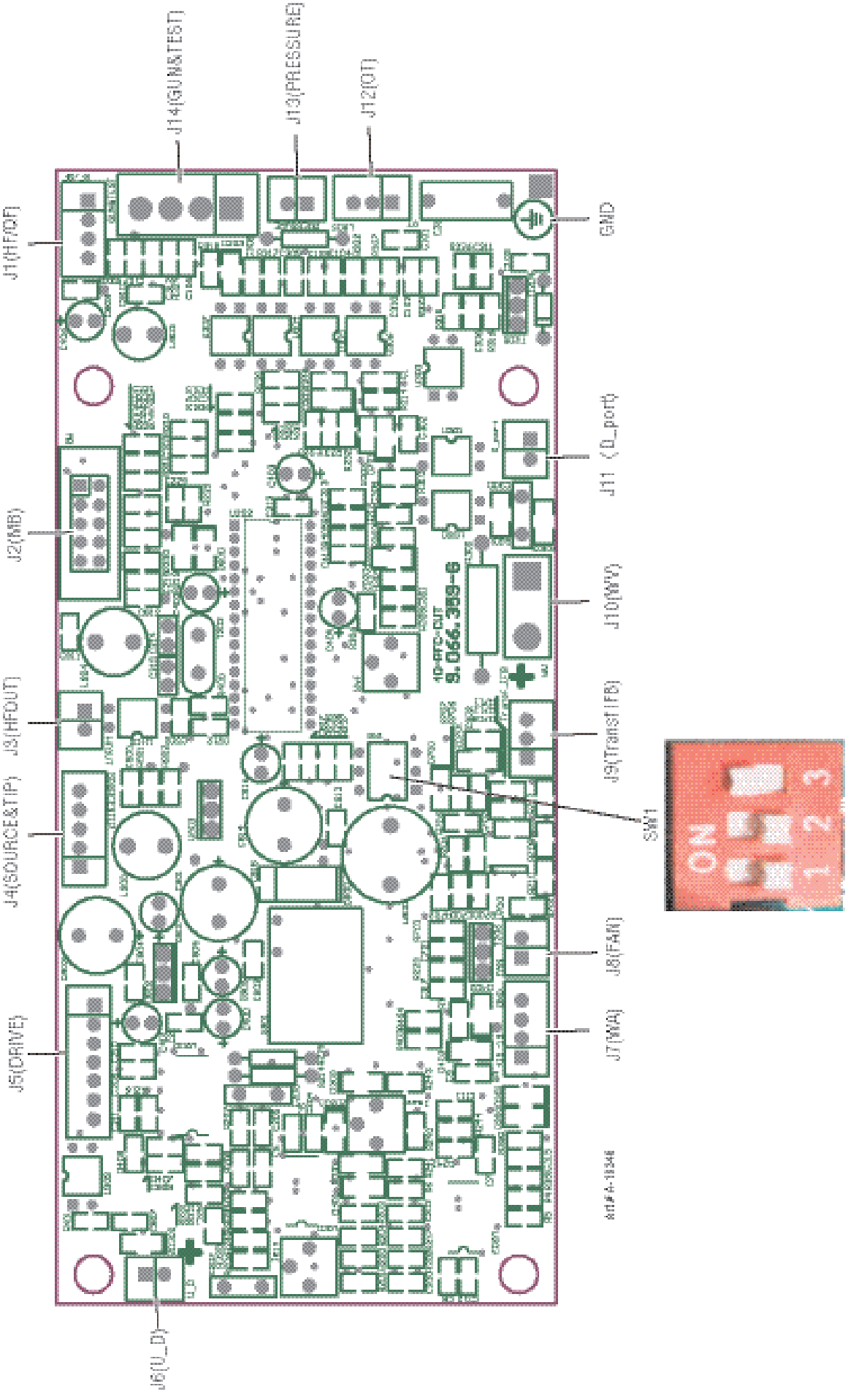
Read and follow safety information in Section 6.03 before proceeding with disassembly

Remove case (refer to 6.05) before remove control board.

Refer to graphics on page 7-3.

1. M4 Screw. Remove 4 screws from Control panel.
2. Disconnect HF/QF harness from HF/QF connector.
3. Disconnect MB harness from MB connector.
4. Disconnect SOURCE&TIP harness from SOURCE&TIP connector.
5. Disconnect DRIVE harness from DRIVE connector.
6. Disconnect U-D harness from U-D connector.
7. Disconnect WA harness from WA connector.
8. Disconnect FAN harness from FAN connector.
9. Disconnect TRANF-IFB harness from TRANF-IFB connector.
10. Disconnect WV harness from WV connector.
11. Disconnect D-PORT harness from D-PORT connector.
12. Disconnect OT harness from OT connector.
13. Disconnect PRESSURE harness from PRESSURE connector.
14. Disconnect GUN&TEST harness from GUN&TEST connector.



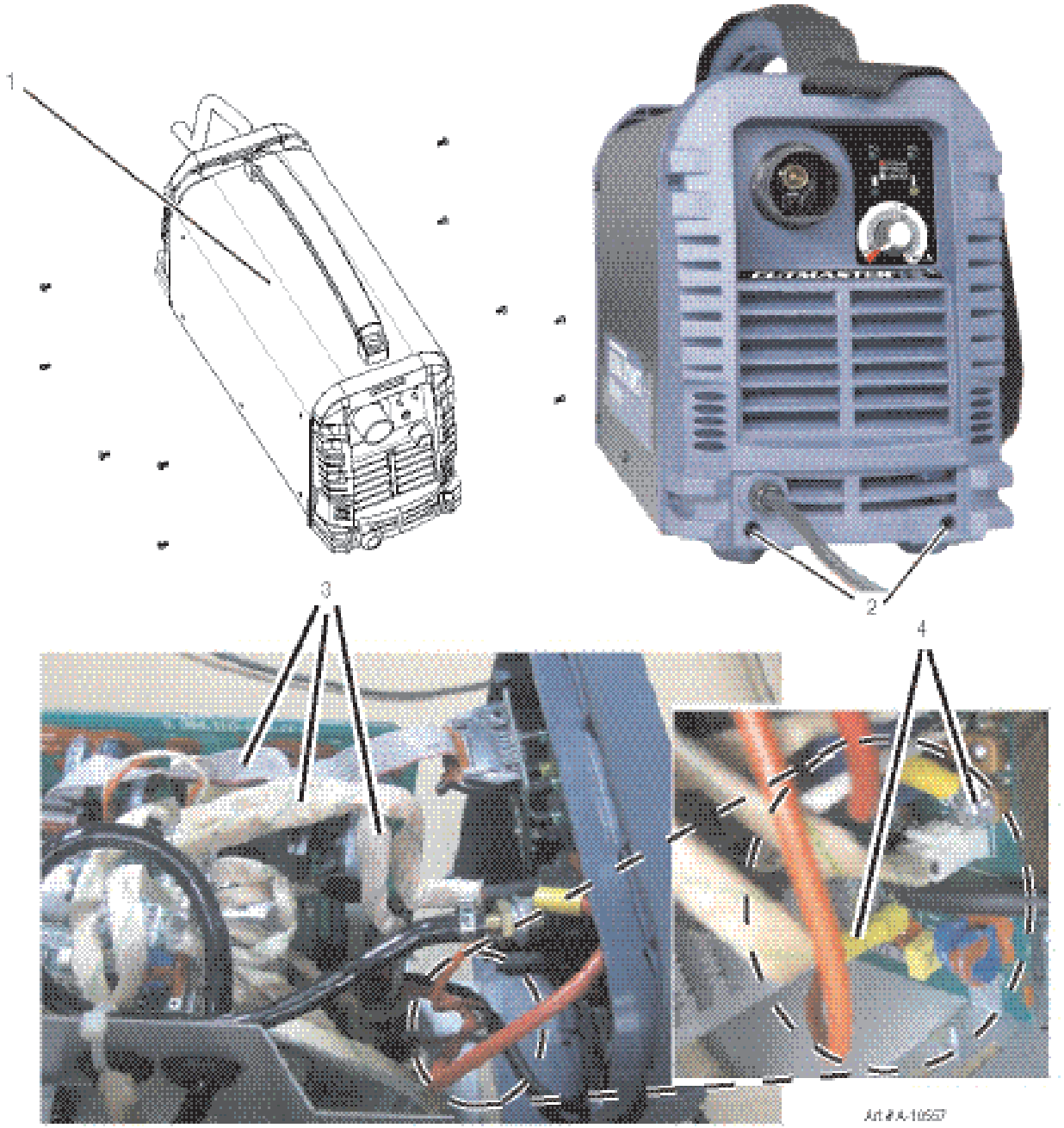

J14(GUN&TEST)
J13(PRESSURE)
J12(OT)
J1(HF/DF)
GND
J2(MB)
J11 (O_port)
J3(HFOUT)
J10(WV)
J4(SOURCE&TIP)
J9(TransfFB)
SW1
ON
1 2 3
J8(FAN)
J5(DRIVE)
J7(WA)
J6(U_D)

7.03 Front Panel Assembly Removal

Read and follow safety information in Section 6.03 before proceeding with disassembly

1. Case removal

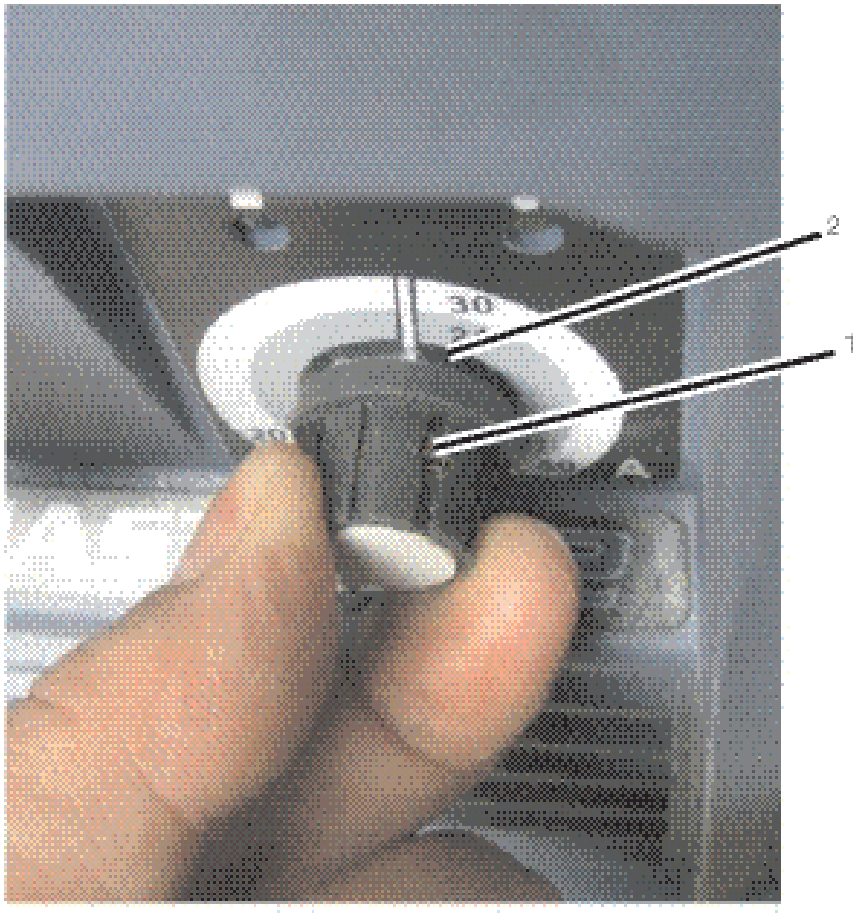
   Remove the ten screws from the cover panel and remove the cover panel
2. Remove the screws on front panel
3. Unplug the three harnesses from control PCB as shown in photo on following page.
4. Remove the two screws.

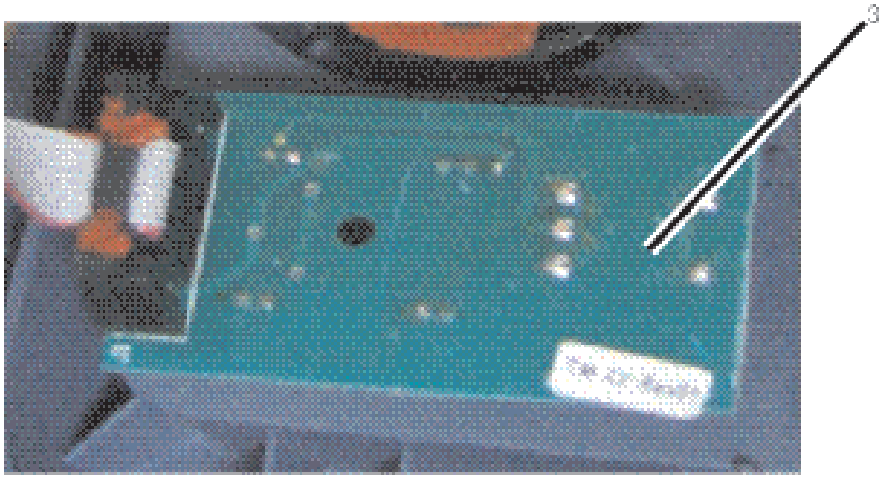


7.04 Front Panel (Operator Interface) Circuit Board PCB3 Removal

Read and follow safety information in Section 6.03 before proceeding with disassembly.

1. Remove the screw on the potentiometer knob.
2. Remove the nut.
3. Remove the front panel PCB.





Art # A-18252

7.05 Back Panel Removal

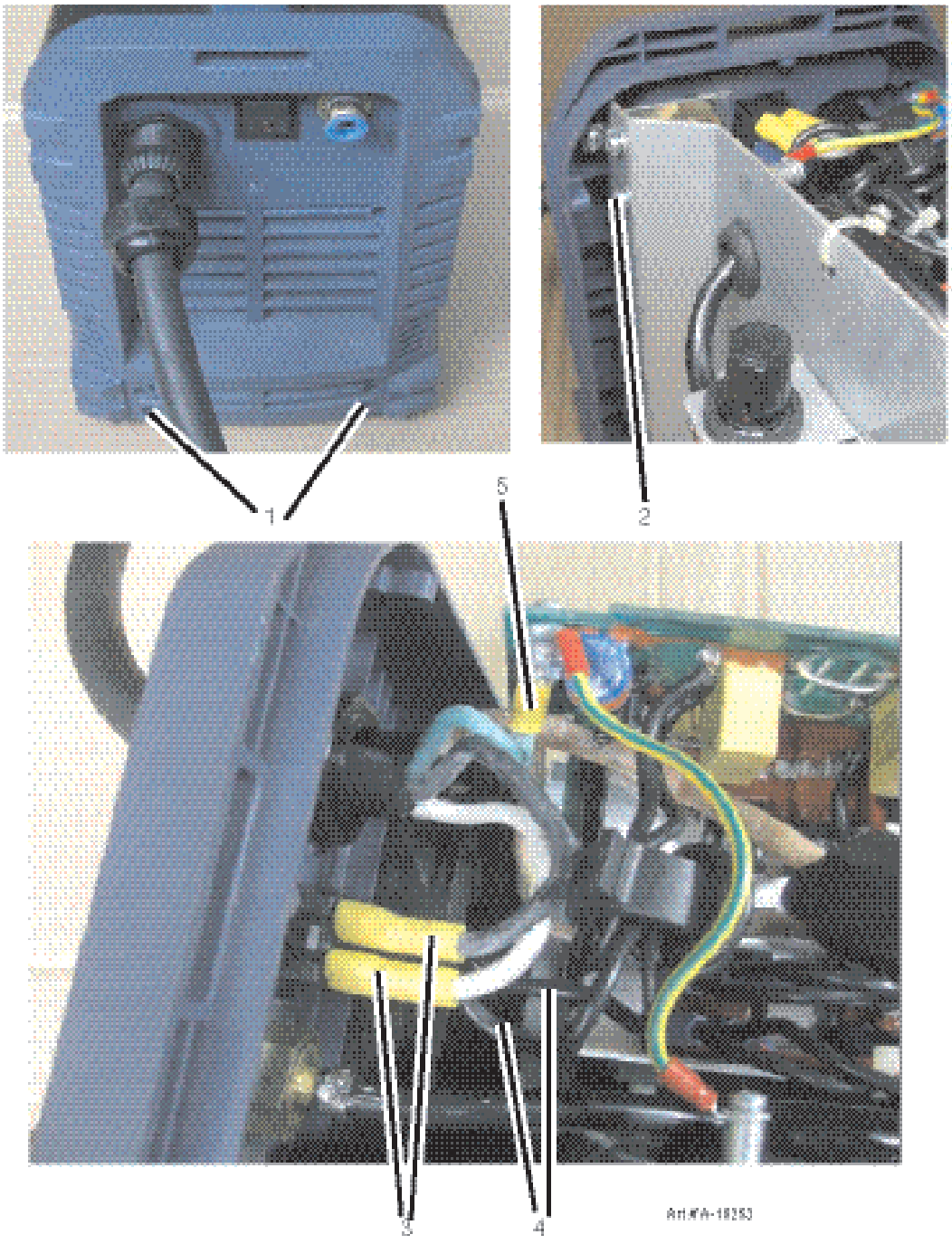
Read and follow safety information in Section 6.03 before proceeding with disassembly

1. Remove screws on back panel
2. Remove the three screws
3. Terminals from supply cable.

   Disconnect two terminals from switch.
4. Wires from main PCB1 .

   Disconnect the two terminals from switch.
5. Goung wire terminal.

   Remove the nut.

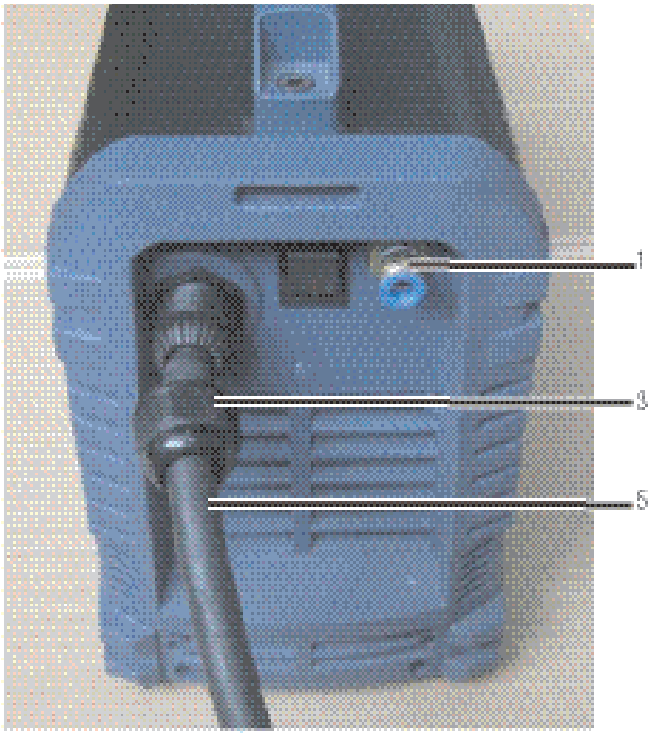


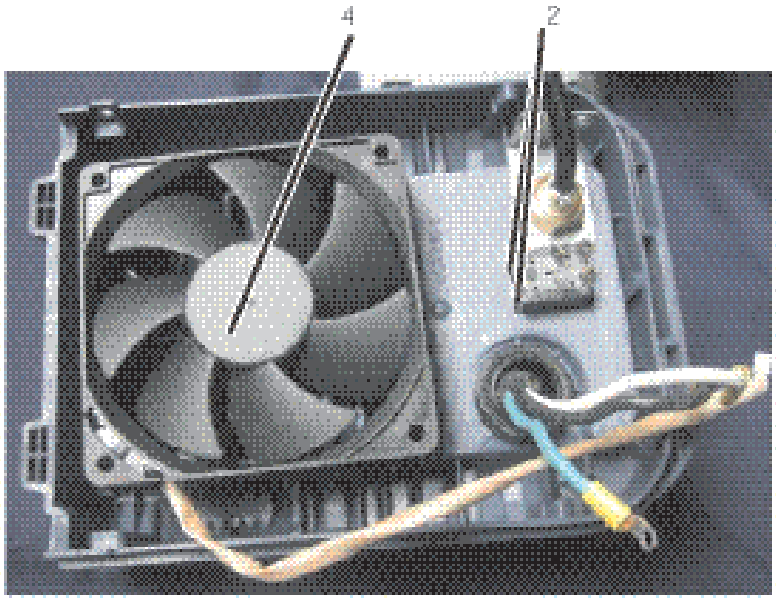
7.06 Power Switch S1 and Power Cord Removal

Read and follow safety information in Section 6.03 before proceeding with disassembly

1. Gas inlet. Remove gas inlet from rear panel.
2. SW locking tabs

   Squeeze the locking tabs and push SW out from the rear panel.
3. Loose the cable anchorage
4. Remove fan
5 Pull the Input Power Cord out.



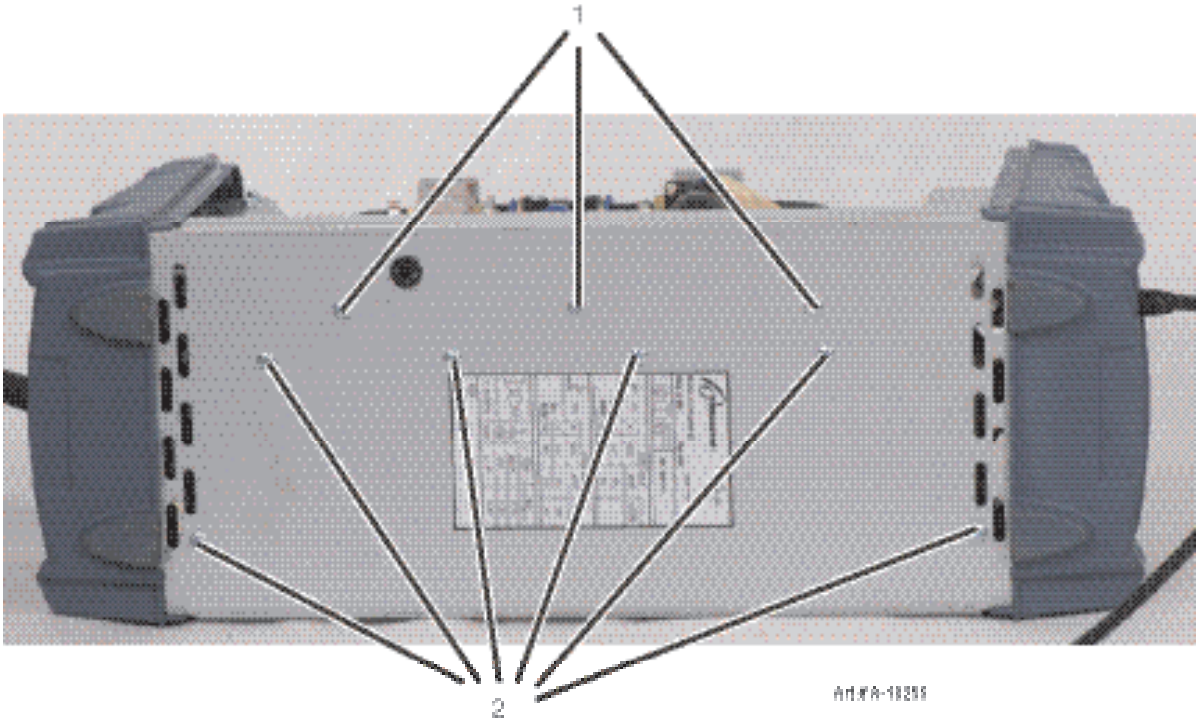


Art # A-18354

7.07 Base Panel Removal

Read and follow safety information in Section 6.03 before proceeding with disassembly

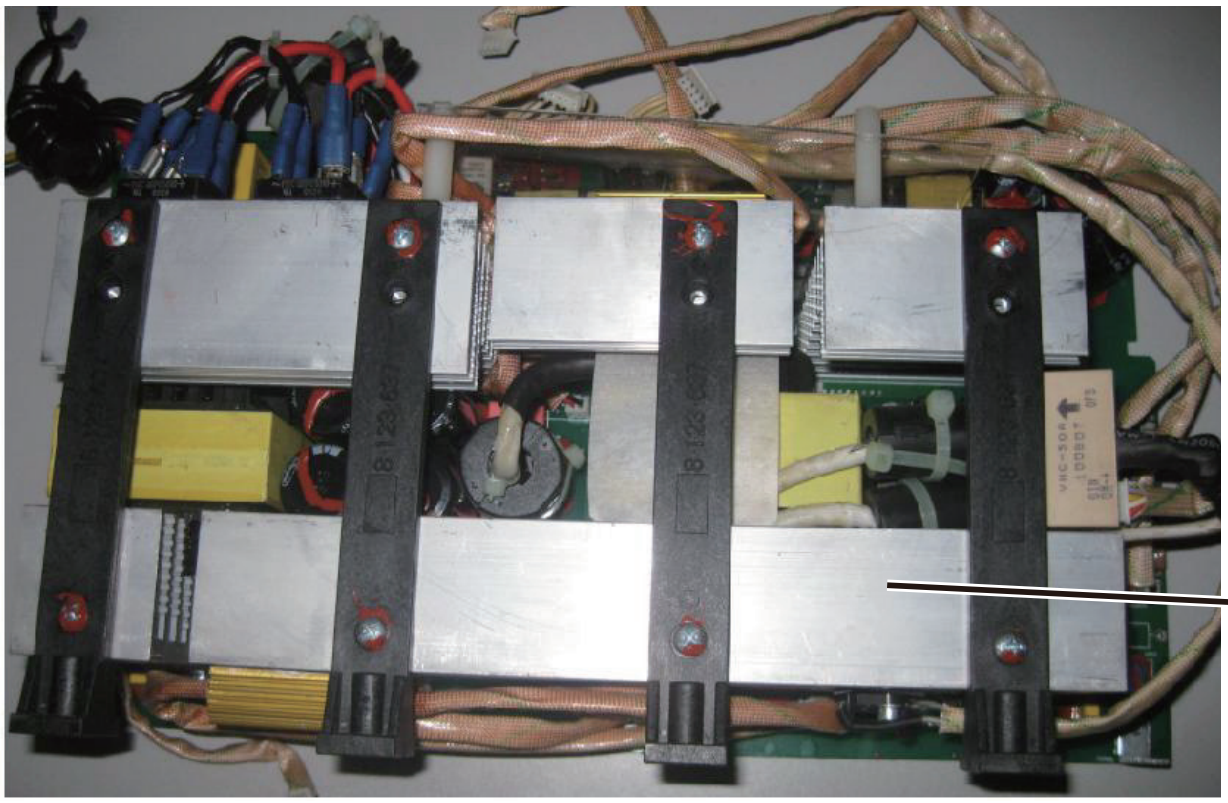
1. Remove Central Panel Screws.
2. Remove Main PCB assembly Screws.

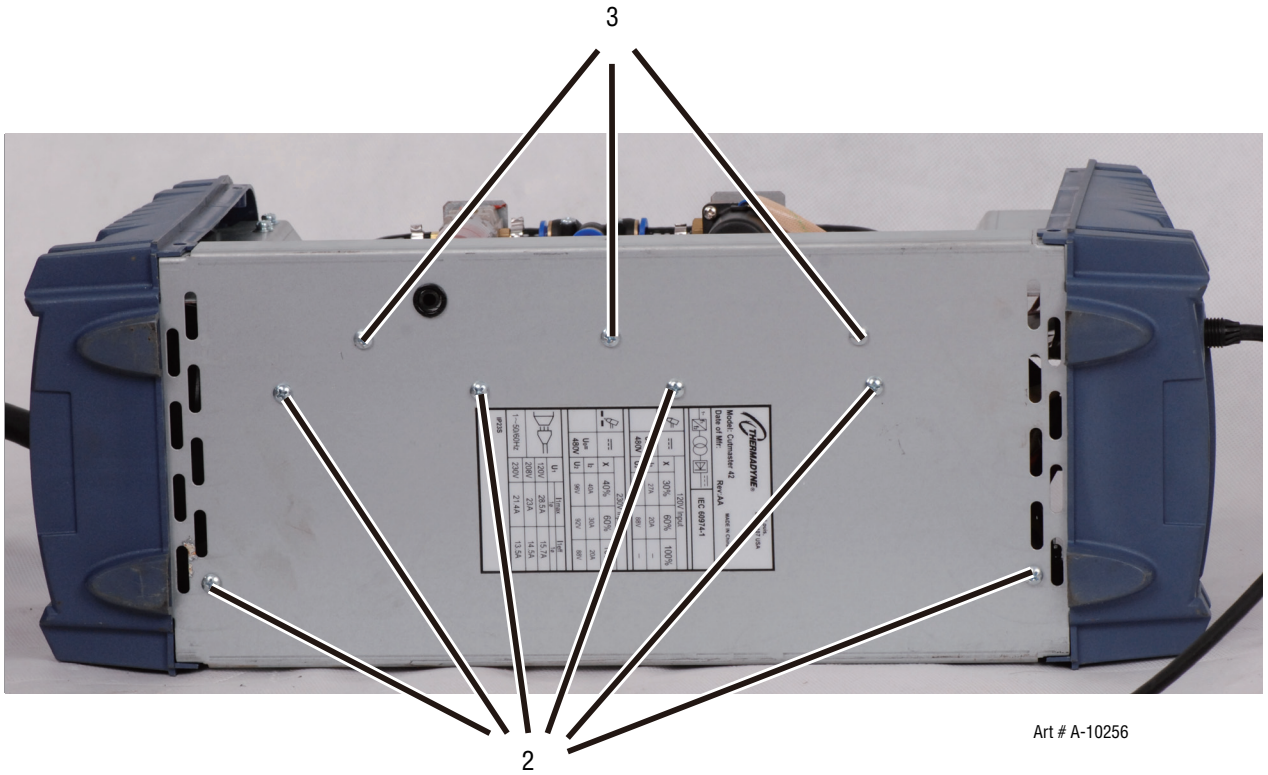


SECTION 8:
ASSEMBLY PROCEDURES

8.01 Installing Base Board

1. Main Power PCB assembly
2. Install main PCB assembly screws
3. Install central Panel Screws.

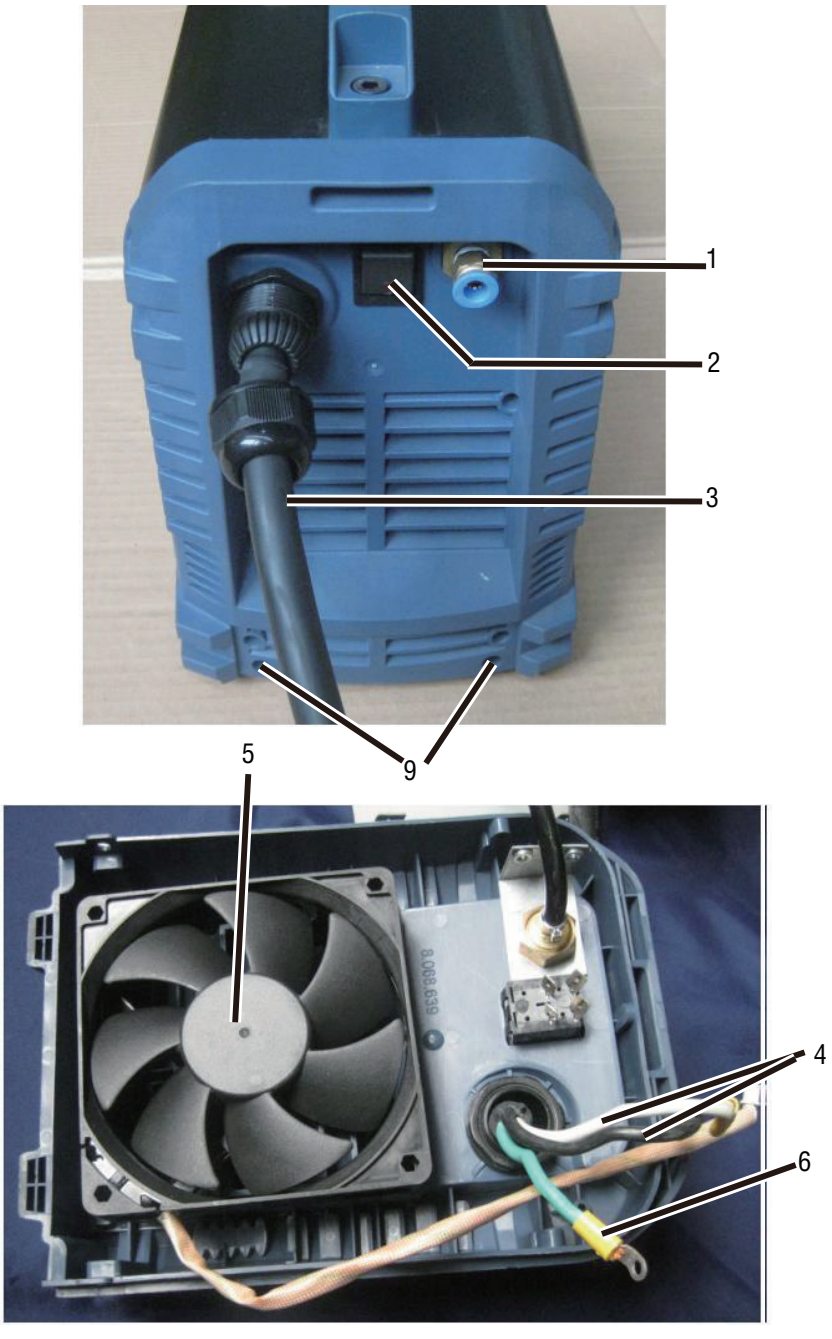




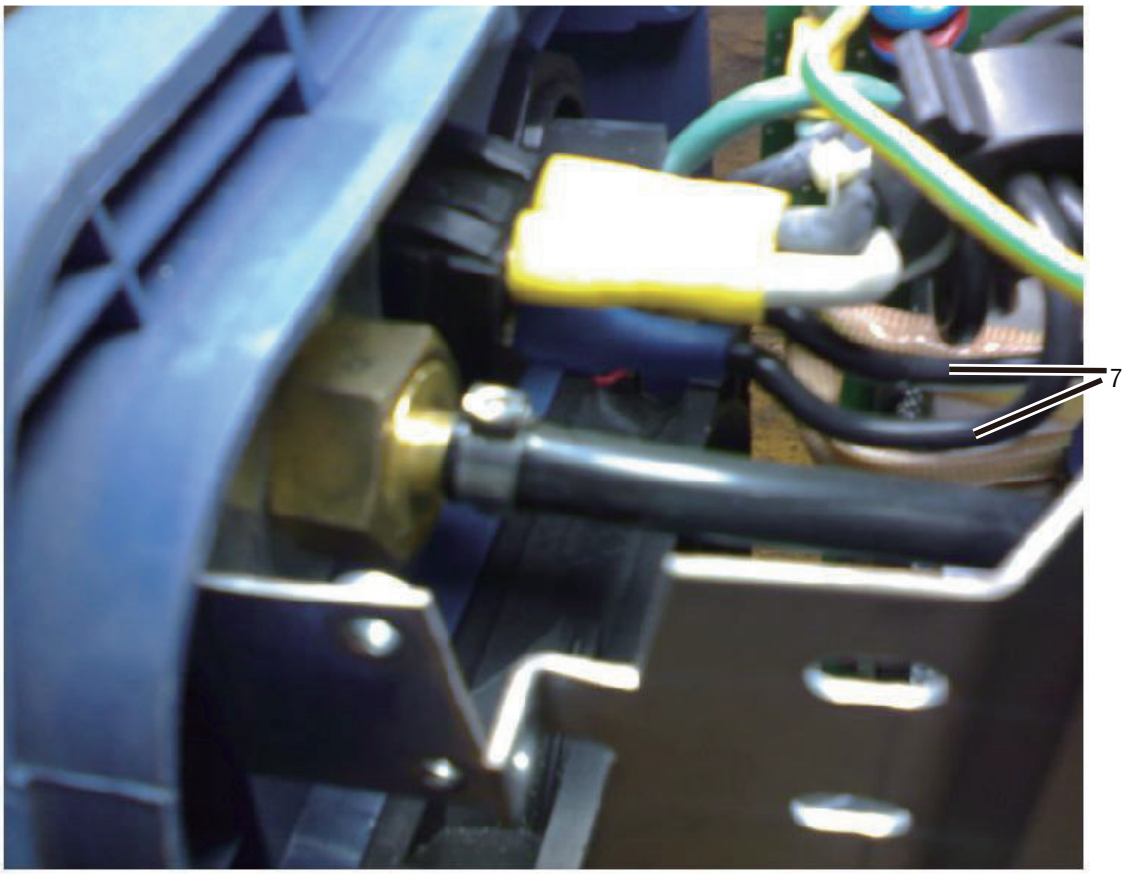
Art # A-10256

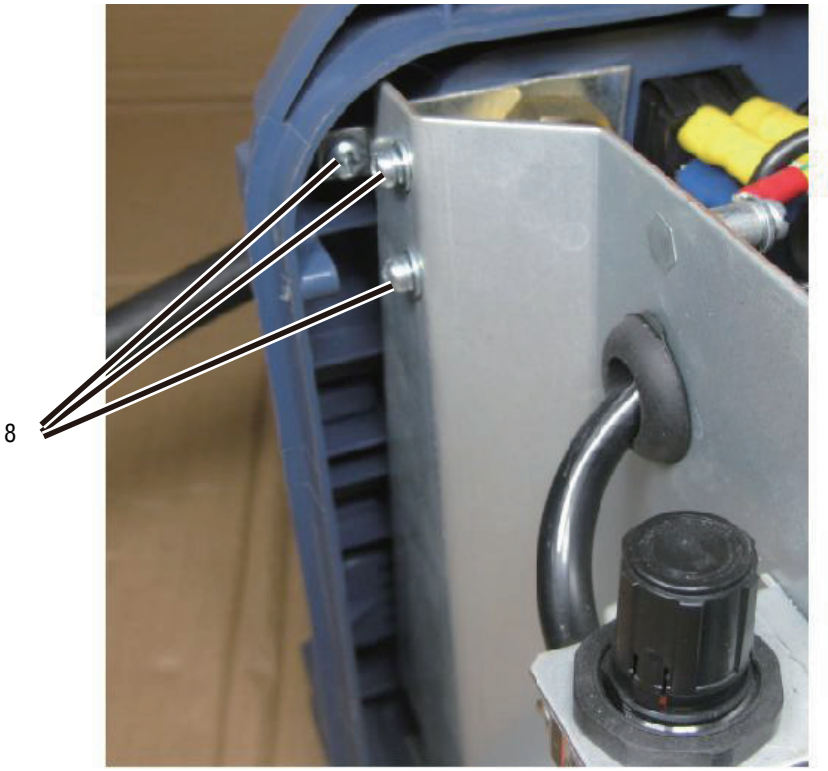
8.02 Installing Back Panel

1. Install gas inlet.
2. Install ON/OFF switch
3. Install wire cord.
4. Reconnect Input Wire on the ON/OFF switch.
5. Install fan.
6. Install ground wire.
7. Reconnect AC input wire on Main Power PCB to power ON/OFF switch.
8. Reconnect the three screws.
9. Reconnect Rear Panel screws.



Art # A-10257

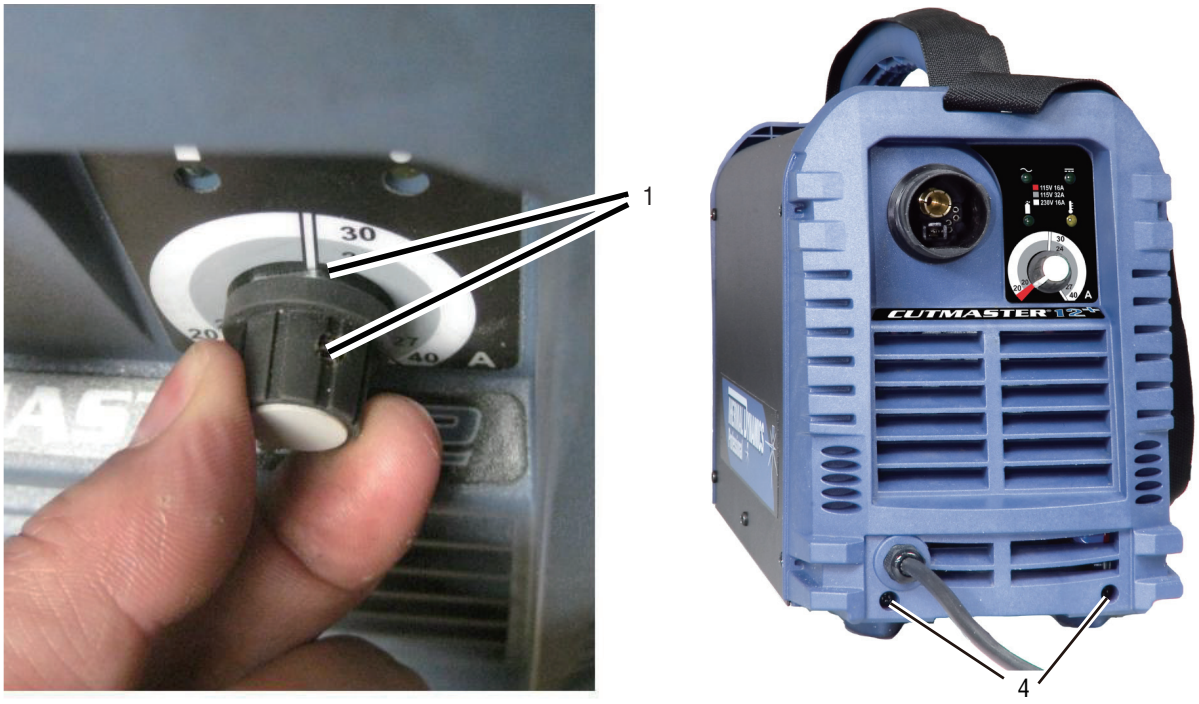


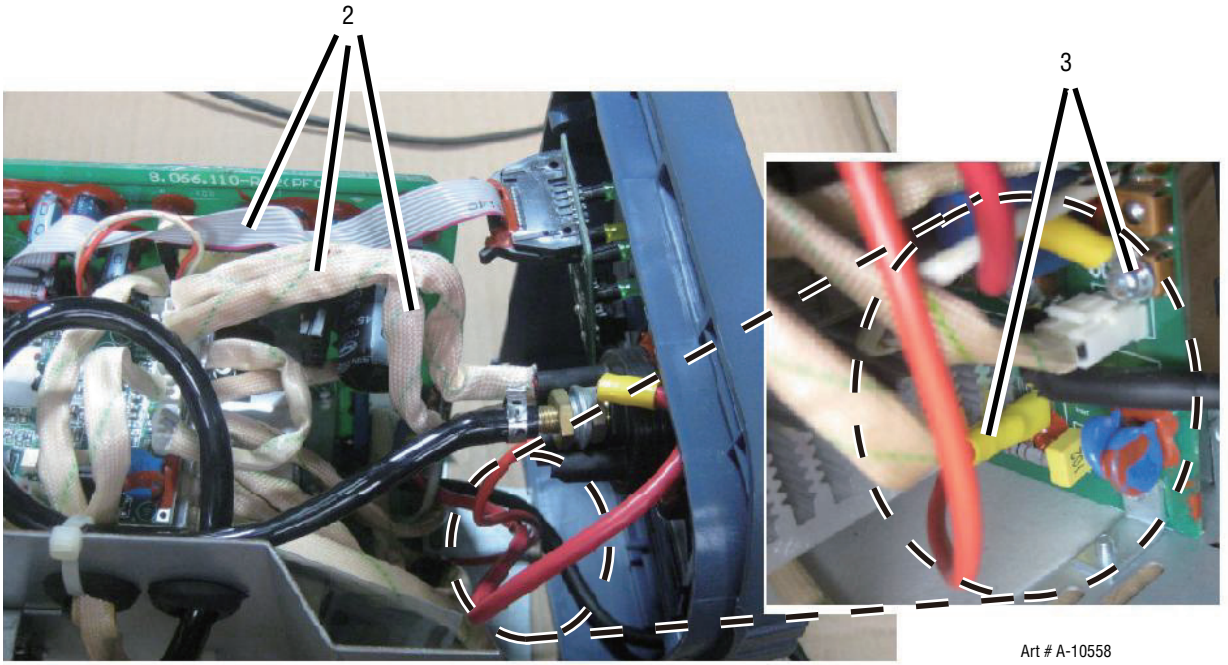


Art # A-10258

8.03 Installing Front Panel

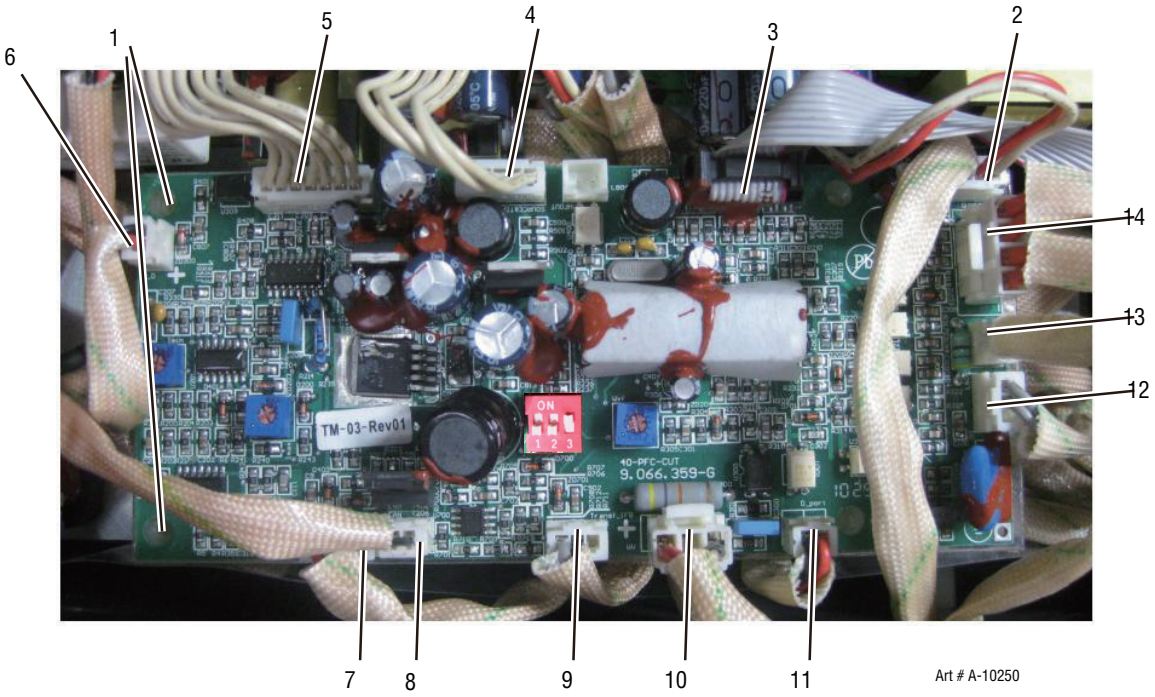
1. Place front panel PCB assembly into front panel. Install the nut and screw.
2. Reconnect three harnesses to control PCB.
3. Reconnect two red wires and install the screws.
4. Install the front panel screws.



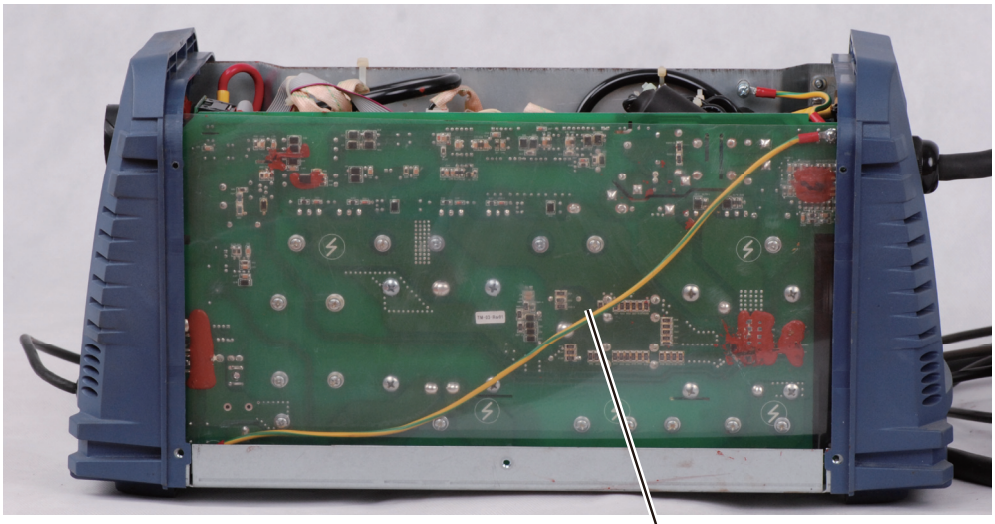


8.04 Installing Main Control Panel and Clear Cover Sheet

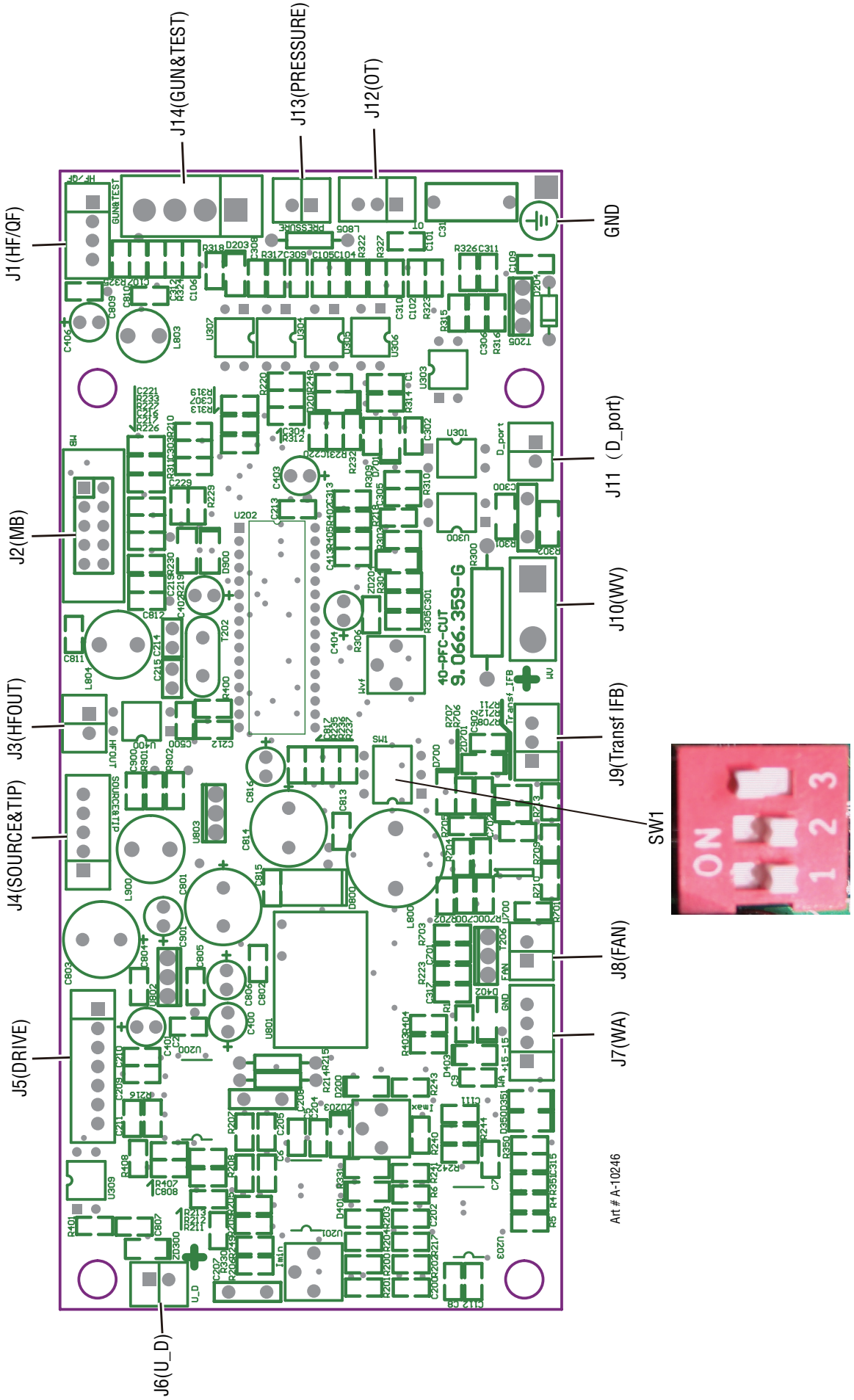
1. Install 4 screws.
2. Plug harness into HF/QF connector
3. Plug harness into MB connector
4. Plug harness into SOURCE&TIP connector
5. Plug harness into DRIVE connector
6. Plug harness into U-D connector
7. Plug harness into WA connector
8. Plug harness into FAN connector
9. Plug harness into TRANF-IFB connector
10. Plug harness into WV connector
11. Plug harness into D-PORT connector
12. Plug harness into OT connector
13. Plug harness into PRESSURE connector
14. Plug harness into GUN&TEST connector
15. Install clear protective sheet.



Art # A-10250



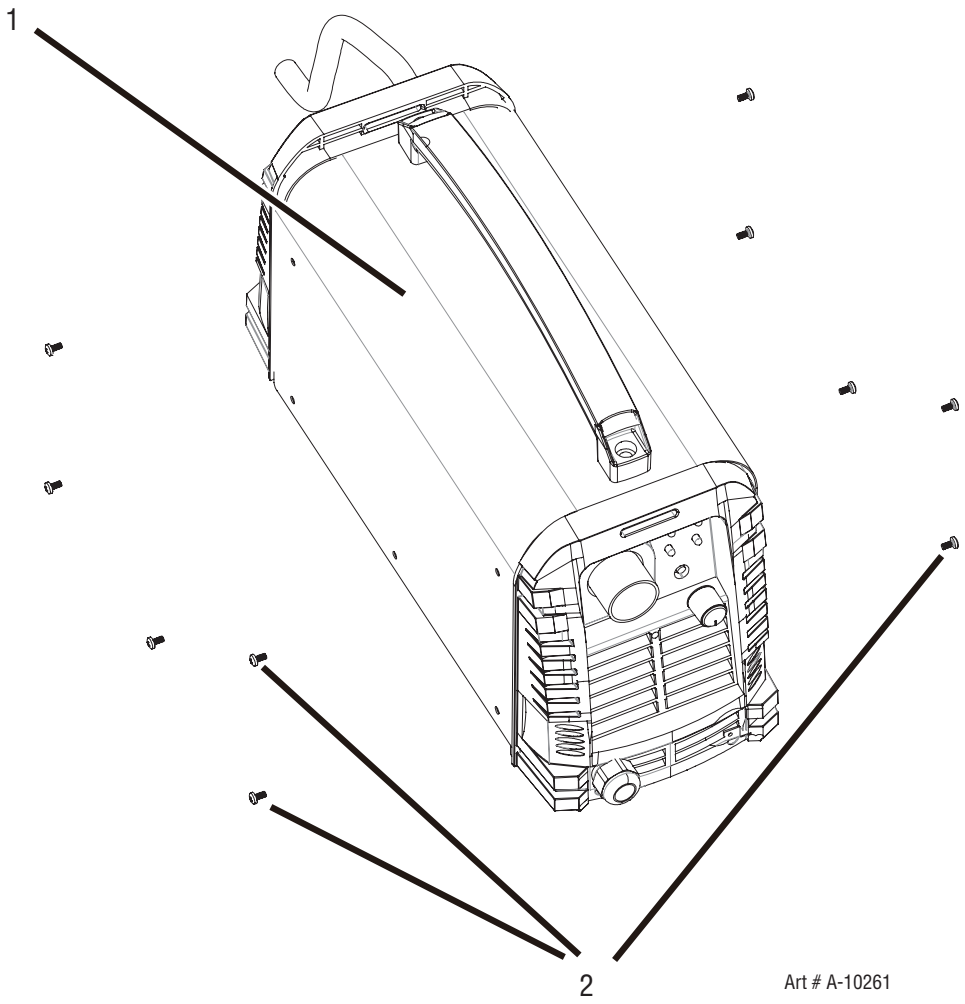
Art # A-10260


J14(GUN&TEST)
J13(PRESSURE)
J12(OT)
J1(HF/QF)
GND
J2(MB)
J11 (D_port)
J3(HFOUT)
J10(WV)
J4(SOURCE&TIP)
J9(Transf IFB)
SW1
J5(DRIVE)
J8(FAN)
J7(WA)
J6(U_D)
Art # A-10246

ON
1 2 3

8.05 Installing Case

1. Install Case.
2. Install Screws. Tighten screws.



Art # A-10261

SECTION 9:
REPLACEMENT PARTS

9.01 Introduction

A. Parts List Breakdown

The parts list provides a breakdown of all replaceable components.

B. Returns

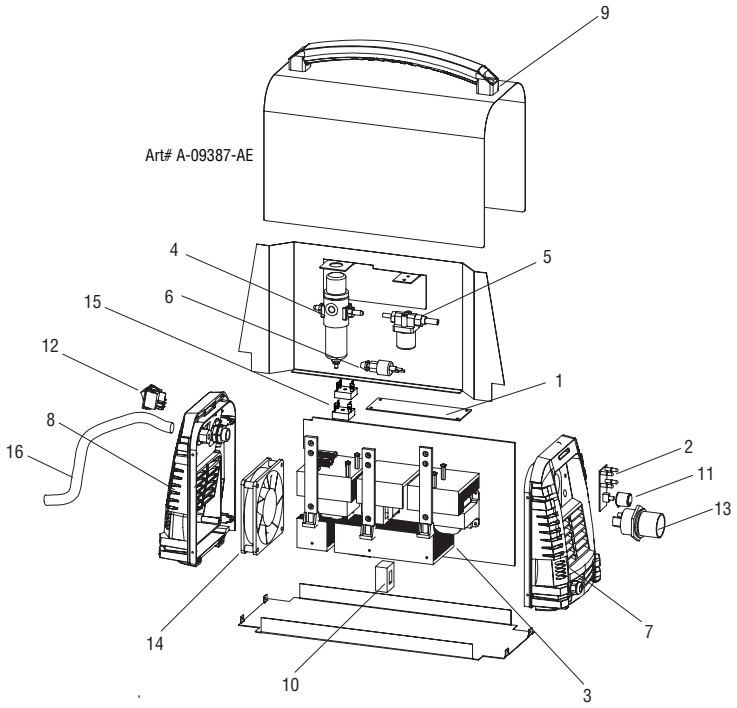
If a product must be returned for service, contact your distributor. Materials returned without proper authorization will not be accepted.

C. Ordering Information

Order replacement parts by catalog number and complete description of the part or assembly, as listed in the parts list for each type item. Also include the model and serial number of the torch. Address all inquiries to your authorized distributor.

9.02 Power Supply Replacement Parts

Item #	Qty	Description	Catalog #
1	1	Control PCB assembly	9-0077
2	1	Front Control PCB assembly	9-0076
3	1	Main PCB assembly	9-0079
4	1	Regulator	9-0081
5	1	Solenoid assembly	9-0082
6	1	Pressure Switch	9-0075
7	1	Front Panel with Label	9-0071
8	1	Rear Panel with Label	9-0072
9	1	Cover with Labels	9-0080
10	1	Hall Current Sensor	9-0088
11	1	CM12+ Cutting Control Knob	9-0073
12	1	CM12+ On/Off Switch	9-0074
13	1	ATC Connection	9-0083
14	1	Fan	9-0042
15	1	AC/DC Rectifier	9-0049
16	1	Power Cord	9-0025
17	1	CM12+ Carry Case (not shown)	9-0084
18	1	Gloves (not shown)	9-0086
19	1	Glasses (not shown)	9-0087
20	1	Replacement Torch (not shown)	7-0040



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